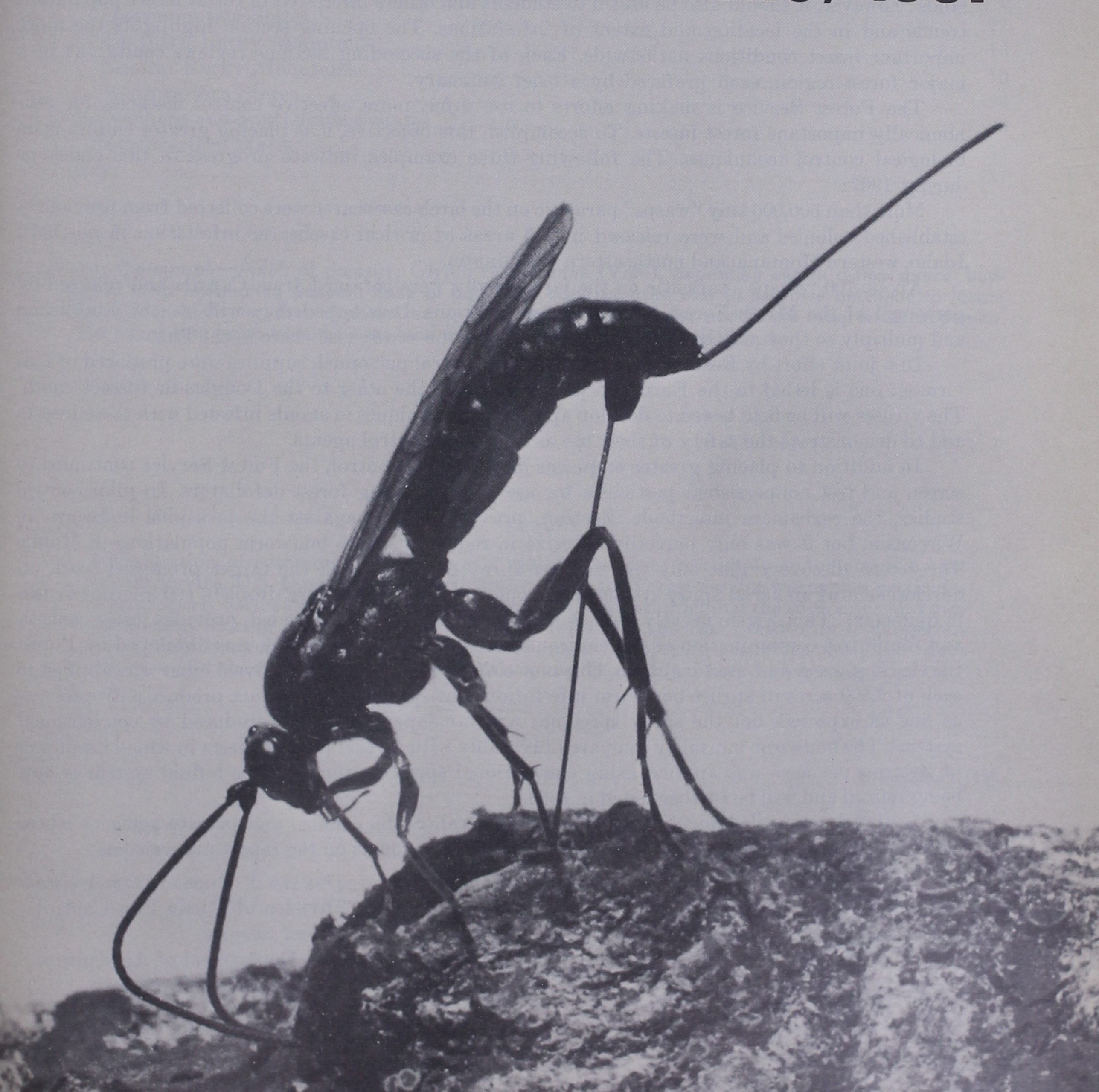
FOREST SERVICE - UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST INSECT CONDITIONS IN THE UNITED STATES/1967



Foreword

This annual report has been compiled primarily for managers of public and private forest lands; however, it should also be useful to students and others interested in forest insect population trends and in the location and extent of infestations. The opening section highlights the more important insect conditions nationwide. Each of the succeeding sections reviews conditions in a major forest region, each prefaced by a brief summary.

The Forest Service is making efforts to use safer, more effective control methods for economically important forest insects. To accomplish this objective, it is placing greater emphasis on biological control techniques. The following three examples indicate progress in this endeavor during 1967:

More than 500,000 tiny "wasps" parasitic on the larch casebearer were collected from previously established colonies and were released in 115 areas of critical casebearer infestation in northern Idaho, western Montana, and northeastern Washington.

About 700 "wasps" parasitic on the larch sawfly were obtained from Canada and released by personnel of the Maine Forest Service at two locations. It is hoped they will become established and multiply so they may be redistributed to combat the sawfly elsewhere in the East.

In a joint effort by Research and Forest Pest Control personnel, supplies were produced of two viruses; one is lethal to the European pine sawfly and the other to the Douglas-fir tussock moth. The viruses will be field tested to develop application techniques in stands infested with these insects and to demonstrate the safety of their use as biological control agents.

In addition to placing greater emphasis on biological control, the Forest Service continued to screen and test nonpersistent pesticides for use in suppressing forest defoliators. In pilot control studies, the carbamate insecticide, Zectran, proved effective against the jack-pine budworm in Wisconsin, but it was only partially effective in reducing spruce budworm populations in Maine. The recent discovery that only the smallest spray droplets reach the target prompted work on development of an aerial spray system that would produce aerosol-size droplets (60 microns or less in diameter). This system greatly reduces the amount of insecticide needed, provides insect control, and minimizes contamination of the environment. A bifluid freon system was developed by Forest Service engineers and used in Idaho. One ounce of Zectran in 1 pint of glycol ether was applied to each of 2,500 acres of spruce budworm infestation. The spray system did not produce a droplet size as fine as expected, but the spray spectrum was far superior to that produced by conventional systems. The budworm mortality compared favorably with several previous tests in which 2.4 ounces of Zectran per acre was applied using conventional spray equipment. The bifluid system is now being refined and will be further tested in 1968.

Grateful acknowledgment is made to all Federal, State, county, and private agencies whose assistance and cooperation made this report possible. Comments on the report are welcome.

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Cover Photograph—Adult of parasite, *Glypta fumiferanae* (Vier.), depositing egg in a tiny spruce budworm larva hibernating beneath flake of bark. The adult parasite uses its sensitive antennae to locate the hidden budworm, then deposits the egg by passing it down the neddlelike tube on its abdomen. The young that hatch from the eggs feed on the budworm, eventually killing it. F—494226

Identification of commercial products and insecticides does not imply endorsement by the Forest Service, U.S. Department of Agriculture. Also, the Forest Service warns that pesticides if improperly used can be injurious to humans, fish, and wildlife; that the directions and precautions governing their use should be closely followed; and that overdosing is dangerous and should be avoided. Special care should be taken in applying pesticides along the edges of rivers and streams, around ponds and lakes, and in grazing and foraging areas.

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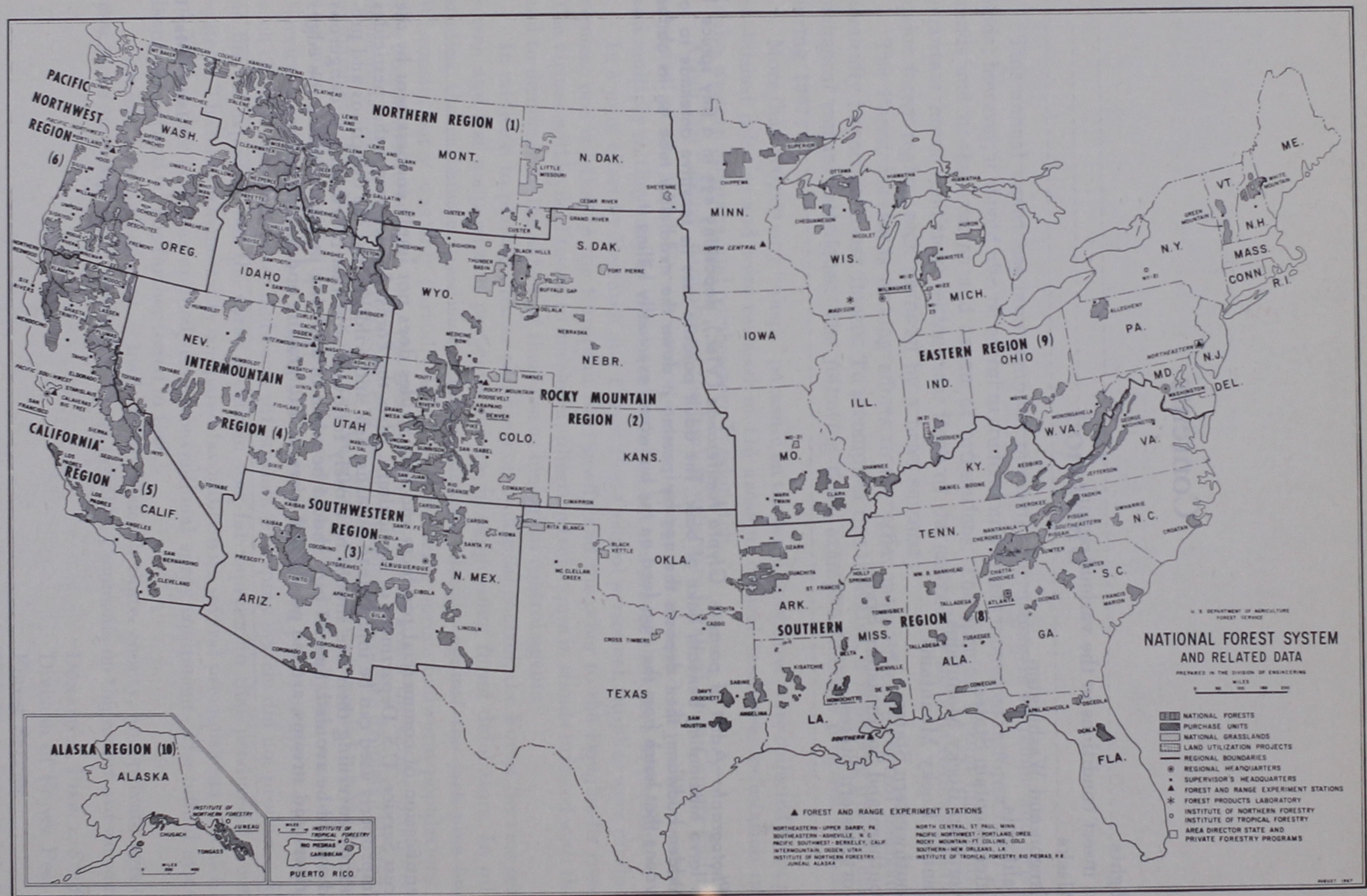
PACIFIC NORTHWEST REGION (6)
NORTHERN REGION (1)
INTERMOUNTAIN REGION (4)
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CALIFORNIA REGION (5)
SOUTHWESTERN REGION (3)
SOUTHERN REGION (8)
EASTERN REGION (9)
WASH.
OREG.
IDAHO
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R.I.
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DEL.
ALASKA REGION (10)
ALASKA
PUERTO RICO
NATIONAL FOREST SYSTEM
AND RELATED DATA
NATIONAL FORESTS
PURCHASE UNITS
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LAND UTILIZATION PROJECTS
REGIONAL BOUNDARIES
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SUPERVISOR'S HEADQUARTERS
FOREST AND RANGE EXPERIMENT STATIONS
FOREST PRODUCTS LABORATORY
INSTITUTE OF NORTHERN FORESTRY
INSTITUTE OF TROPICAL FORESTRY
AREA DIRECTOR STATE AND PRIVATE FORESTRY PROGRAMS
▲ FOREST AND RANGE EXPERIMENT STATIONS
NORTHEASTERN - UPPER DARBY, PA.
SOUTHEASTERN - ASHEVILLE, N. C.
PACIFIC SOUTHWEST - BERKELEY, CALIF.
INTERMOUNTAIN, OGDEN, UTAH
INSTITUTE OF NORTHERN FORESTRY, JUNEAU, ALASKA
NORTH CENTRAL, ST. PAUL, MINN.
PACIFIC NORTHWEST - PORTLAND, OREG.
ROCKY MOUNTAIN - FT. COLLINS, COLO.
SOUTHERN - NEW ORLEANS, LA.
INSTITUTE OF TROPICAL FORESTRY, RIO PIEDRAS, P.R.

Highlights

Situation in the Western States

The dominant insect pests affecting timber resources in the Western United States were bark beetles. Old infestations of mountain pine beetle were still widespread in lodgepole pine on the Targhee National Forest, Idaho, and on the Bridger and Teton National Forests, Wyo., but notable decreases in beetle populations were observed in some areas, and an overall reduction in tree killing is expected in 1968. Mountain pine beetle killing of sugar pine increased along the Feather River in California, and 25,000 ponderosa pines were killed in Montana and Idaho. In the Central Rocky Mountains the same beetle is usually referred to as the Black Hills beetle. There it destroyed ponderosa pine stands on the San Juan and Roosevelt National Forests in Colorado and on the Black Hills National Forest in South Dakota; and attacked lodgepole pine trees on the Shoshone National Forest in Wyoming and on the Arapaho and White River National Forests in Colorado.

Other troublesome bark beetles included the Engelmann spruce beetle, which persisted in logging debris in the Southwestern States and in Colorado and Wyoming; the Douglas-fir beetle in northern Washington and southern Idaho; and the western pine beetle in California.

Across the Western States, insect pests other than bark beetles also presented problems but were less important economically.

In Alaska there was concern about increasing insect activity. The Sitka spruce beetle continued to spread in the Kenai Peninsula, and control work is now planned to protect those areas in the peninsula of high recreational and scenic values. Extensive areas of aspen in the interior from Anchorage to Fairbanks and eastward were defoliated by the large aspen tortrix. The hemlock sawfly was active over much of southeastern Alaska.

Forest insect damage in Oregon and Washington was the worst in nearly 10 years. Defoliators were the principal pests; the larch casebearer caused the most destruction as infestations of this pest continued to spread. Larch bud moth damaged 140,000 acres in northern Washington, and needle miners, though less numerous than in 1966, extensively defoliated lodgepole and ponderosa pine stands in central Oregon and Washington. The Douglas-fir beetle also reached outbreak status in Washington.

The overall forest insect situation improved in California when the Douglas-fir beetle epidemic in north coastal Douglas-fir was controlled. Lack of rainfall, however, again resulted in increased activity of mountain pine beetle and western pine beetle in ponderosa and sugar pine in the northern part of the State.

In the Northern Rocky Mountains total bark beetle activity increased, while defoliator infestations decreased in some areas. Mountain pine beetle populations reached outbreak conditions in lodgepole and ponderosa pine stands in Montana and continued to be a problem in western white pine stands on the Kaniksu, Coeur d'Alene, St. Joe, and Clearwater National Forests in Idaho. A hot, dry summer abetted a buildup of engraver beetles in slash in western Montana. Natural factors reduced the larch sawfly populations, and the larch bud moth infestation in Montana decreased from 518,000 acres in 1966 to 110,000 acres in 1967. Incidence of spruce budworm decreased east of the Continental Divide; the center of infestation moved west and north.

In the Central Rocky Mountains the most troublesome insect was the Black Hills beetle. Scattered infestations occurred in ponderosa pine forests on the San Juan and Roosevelt National Forests, Colo., and on the Black Hills National Forest, S. Dak.; and in lodgepole pine stands on the Shoshone National Forest, Wyo., and on the Arapaho and White River National Forests, Colo. The first large pine engraver outbreak in the Central Rocky Mountains appeared near Halsey,

Nebr. However, the epidemic was quickly reduced to tolerable levels. There was a slight increase in area of spruce budworm defoliation, but no top-killing was evident.

With one major exception, forest insect problems in the Intermountain Region were comparatively minor. That exception was the mountain pine beetle epidemic, which continued to deplete stands of lodgepole pine in southern Idaho, western Wyoming, and northern Utah. The huge outbreak in the Teton Wilderness of western Wyoming, which showed signs of lessening in 1966, declined even further in 1967. On the Targhee National Forest in eastern Idaho, tree killing continued at an alarming rate. Woodpeckers and other natural enemies of the beetles helped lessen their impact on the Bridger National Forest. Areas which had a history of heavy defoliation from spruce budworm experienced only light damage on small portions of these areas. Infestations from other pests, such as Douglas-fir beetle, engraver beetles, Douglas-fir tussock moth, and sugar pine tortrix, all showed evidence of declining destructive capacity.

In the Southwest, Engelmann spruce beetle increased sharply as a result of an abundance of host material blown down in windstorms in 1966. Douglas-fir tussock moth appeared in two new areas in southeastern New Mexico. Defoliation from the spruce budworm decreased. A new outbreak of roundheaded pine beetle killed young ponderosa pine in New Mexico, and the Arizona five-spined ips destroyed ponderosa pine in Arizona. The southwestern pine tip moth infested 94,000 acres of natural ponderosa pine reproduction and 3,200 acres of plantation seedlings in north central Arizona.

Situation in the Southern and Southeastern States

The principal insect pest in the South and Southeast was the southern pine beetle. This beetle again developed to epidemic proportions in Texas, in the Gulf States, and in Georgia, the Carolinas, and Virginia. A long, late-summer drought encouraged an outbreak of engraver beetles in localized areas of the coastal States. The black turpentine beetle continued to infest stumps and residual trees in logging areas in Louisiana, Mississippi, and Texas. Meanwhile, the Nantucket pine tip moth continued to be a serious problem in seed orchards and in nurseries, and damage by most other defoliating insects continued at the 1966 level. Fortunately, a wet summer in North Carolina and Tennessee was a deterrent to the spread of balsam woolly aphid in Fraser fir forests. In North Carolina only one new area of infestation was found.

Situation in the Lake and Central States and the Northeast

In the Northeastern States spruce budworm activity increased in northern Minnesota and in northern Maine. Near Oxbow, Me., 100,000 acres of budworm infestation were sprayed by the Maine Forest Service, and 80,000 more acres may require chemical control in 1968. Control measures may also be necessary against the jack-pine budworm, which caused heavy defoliation in Michigan, Minnesota, and Wisconsin. A fall cankerworm-oak leaf tier complex defoliated oaks in New Jersey, New York, Pennsylvania, and West Virginia. A 1966 infestation of forest tent caterpillar in the international border area of southern Ontario and northern Minnesota spread southeasterly, and the saddled prominent defoliated hardwoods in a section from the Lake States to New England. Saratoga spittlebug persisted in red pine plantations in the Lake States. In New England, thousands of acres of birches were defoliated by the birch leaf skeletonizer and leaf miner, and balsam fir was damaged by balsam woolly aphid. Other insect pests of less concern were the maple scale, gypsy moth, browntail moth, red-headed pine sawfly, and white-pine weevil.

Suppression Activities

Federal and State agencies, and owners and managers of private forest lands continued united efforts during 1967 to check the damage and loss caused by insects. The major control efforts in the Nation were directed against bark beetles.

The largest suppression undertaking in the country was again aimed at control of mountain pine beetle in lodgepole pine on the Targhee and Teton National Forests, in Grand Teton National Park, and on adjacent private lands in the Intermountain States. A modified control program on

the Targhee Forest will be continued in 1968. Beetle populations on the Teton Forest and Teton Park have been so reduced that no further treatment is required. Wherever this beetle is a problem in the West, increased effort is being placed on logging of infested trees and on converting susceptible, overmature stands of lodgepole and ponderosa pine to a young, vigorous state. As this work progresses, less dependence will be placed on control by felling and burning, or on treating with toxic oils.

On the Nebraska National Forest, a sudden outbreak of the pine engraver beetle was promptly quelled by the concerted efforts of foresters, Job Corpsmen, National Guardsmen, and local laborers. They felled and chemically treated the infested trees.

In the South and Southeast, logging of infested trees has been used where possible to control the southern pine beetle; however, an upsurge in beetle populations necessitated the increased use of chemical control. Control of black turpentine beetles was mainly confined to the treatment of infested stumps in logging areas. On some low wet sites it was necessary to treat residual trees.

The largest defoliator suppression effort was directed against spruce budworm infesting high-value spruce-fir stands in Maine. In this cooperative project, 100,000 acres of infested type were aerially treated with DDT. Some virulent budworm populations still exist in Maine and may require treatment in 1968.

The Forest Service continues to search for a substitute for DDT. Zectran, the carbamate that shows promise for budworm control, was further tested. In Idaho, 2,500 acres of budworm-infested trees were aerially sprayed with Zectran at the rate of 1 ounce in 1 pint of glycol ether per acre. An 87-percent reduction in the budworm population was obtained. However, due to a general collapse of the budworm populations in areas adjacent to the test area, and due to difficulties encountered in the special spray system used, further tests will be necessary before this low dosage of Zectran can be recommended for operational use. In a test of Zectran against a small area infested by jack-pine budworm in Wisconsin, the budworm population was reduced by 91 percent. Zectran was also tested on a 500-acre area of the spruce budworm infestation in Maine, but the results of this application, using conventional spray equipment, were unsatisfactory.

In other suppression activities, high-value Fraser fir in North Carolina was sprayed to prevent infestations of balsam woolly aphid; pines in the Lake States were treated to control infestations of Saratoga spittlebug and red-headed pine sawfly; applications of *Bacillus thuringiensis* (Berliner) provided maintenance control of Nevada buck moth populations at White Sands National Monument, N. Mex., and of tent caterpillar populations at Zion National Park, Utah; cultural and trap tree methods were used in Alaska and the Southwest to control spruce beetles; and ornamental trees in the Portland, Oreg., area infested with European pine shoot moth were either fumigated or destroyed.

Pest suppression projects are summarized in the following tabulation :

Pest Control Accomplishments in the United States, 1967

Insect	*Location*	*Trees treated*	*Acres sprayed*
Southern pine beetle	South and Southeast	156,000	----------
Black turpentine beetle	do	[1] 183,000	----------
Western pine beetle	California and Utah	6,500	----------
Black Hills beetle	South Dakota, Colorado, and Wyoming	62,500	----------
Mountain pine beetle	Utah, Idaho, Wyoming, and California	547,000	----------
Spruce budworm	Montana, Idaho, and Maine	----------	125,000
Jack pine budworm	Wisconsin	----------	1,000
Balsam woolly aphid	Tennessee, North Carolina, and Arkansas	224,500	----------
Miscellaneous	Entire United States	51,000	1,500
Total		1,230,500	127,500

[1] Includes treating of stumps.

Forest Insect Conditions in the Various Regions

ALASKA

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Conditions in Brief

The outbreak status of three forest insects caused concern in Alaska. The hemlock sawfly was active over much of southeastern Alaska, and significant top killing and tree mortality are expected. The large aspen tortrix almost completely defoliated aspen over extensive areas in interior Alaska. The spruce beetle increased markedly on the Kenai Peninsula near Anchorage, where it seriously threatens scenic and recreational areas.

The black-headed budworm, recently of great concern in the southeastern Alaska Panhandle, remained at very low levels following a population collapse in 1965.

Status of Insects

Hemlock sawfly, *Neodiprion tsugae* Midd. Sawfly populations in southeastern Alaska remained high, with old infestation spots subsiding and new ones taking their places. There were indications of a general decline north of Frederick Sound, and an increase in both number and size of infestations to the south. An infestation in Peril Strait from Todd to Sitkoh Bay is expected to cause appreciable top killing and tree mortality. These infested stands were included in a current timber sale.

Significant areas of medium and heavy defoliation exist on the west and northwest sides of Kupreanof Island and adjacent Kuiu Island, the northern and west central portions of Prince of Wales Island, and adjacent Kosciusko Island.

Heavy populations often subside after 2 years with no visible effects, but when heavy feeding continues for more than 2 years (as in the case of the Todd area on Peril Strait), significant tree mortality may occur. Because of this tendency for populations to subside before serious harm results, and the practice of including affected stands in timber sales, no direct control measures are planned for the heavy sawfly populations in southeastern Alaska. However, should evaluations show a population increase in a defoliated area near Sitka, control of the sawfly there may be considered in 1968. This is not only a valuable scenic area, but adjoins National Forest stands of recreational and scenic value.

Large aspen tortrix, *Choristoneura conflictana* (Wlk.). Outbreak populations of this insect on quaking aspen were common throughout interior Alaska from Anchorage to Fairbanks and eastward to the Yukon border. Some feeding was noted on balsam poplar, paper birch, and alder. Of particular concern was a 10,000-square-mile area between Tok Junction and Fairbanks, where complete stripping of trees was common on ridgetops and southeastern slopes. Parasitism was high in the old areas, but where defoliation was heavy for the first time in 1967, the insect populations were relatively free of natural enemies. Forest Service research entomologists believe the probable overall trend is declining. Except for possible treatment of a few valuable recreation areas, no control measures are contemplated for 1968.

Sitka spruce beetle, *Dendroctonus obesus* (Mann.), remained one of the most important insect enemies of Sitka and white spruce in Alaska. Haines, in southeastern Alaska, reported renewed beetle activity in old outbreak centers inactive for the past 4 years. Significant damage was also reported in the Kenai Peninsula. On the Moose Range there, a 200–acre "hotspot" extended its borders noticeably during 1967 while the proportion of attacked trees in the area increased markedly.

Increased beetle activity on the Chugach National Forest prompted the Forest Service's first efforts at bark beetle control in Alaska. Preliminary work at Kenai Lake using the trap-tree technique has apparently given good results. Control

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is planned for units of 300 and 1,200 acres to protect areas of high recreational and scenic value.

In response to a survey report, a 4-hour flight was made from Anchorage westward to the junction of Stoney Creek and the Kuskokwim River, and northward to McGrath to search for bark beetle damage. No infestation centers were found and very few off-color trees observed.

Black-headed budworm, *Acleris variana* (Fern.), was rarely seen during the summer of 1967. It has remained at a low level since 1965, when abnormally high temperatures during the early larval stages apparently brought the outbreak under control. Low budworm populations have persisted since then on northern Prince of Wales Island and nearby Kuiu Island.

Western hemlock looper, *Lambdina fiscellaria lugubrosa* (Hulst). The western hemlock looper epidemic reported in the Bradfield River area subsided to an extremely low level. No new defoliation was found.

Redwood bark beetle, *Phloeosinus sequoiae* Hopk. Attacks by this beetle at several locations in southeastern Alaska remained at moderate levels. Preliminary investigations indicate factors other than the cedar bark beetle may be involved in the excessive mortality of western red cedar in southeastern Alaska. No control is planned.

Spruce aphid, *Elatobium abietinum* (Wlk.), was found seriously injuring 5- to 6-foot ornamental Sitka spruce adjacent to valuable forest stands near Sitka. Control measures were recommended.

Unidentified. A potential threat to spruce stands on southern Kenai Peninsula was indicated by an area of about 75 acres of moderate to heavy defoliation near Anchor Point. No insects were found, but damage was very similar to that caused by a geometrid active in the same area in the early sixties. At that time, heavy defoliation of spruce was observed on both shores of Kachemak Bay.

OREGON AND WASHINGTON

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Conditions in Brief

Forest insect damage in Oregon and Washington was the highest since 1958. Defoliators caused the most damage; the larch casebearer was among the most destructive. Larch bud moth caused widespread damage in northern Washington. Needle miners, although fewer than last year, extensively defoliated lodgepole and ponderosa pine stands in central Oregon and Washington. In northeast Washington, the Douglas-fir beetle reached serious outbreak levels.

The Pacific Northwest experienced a prolonged drought in 1967. Significant tree killing occurred in the Willamette Valley and in other areas. Since drought-weakened trees are often attacked by various bark beetles, further losses are expected in 1968.

Status of Insects

Larch casebearer, *Coleophora laricella* (Hbn.). Infestations continued to spread in northeastern Washington. Light to extremely heavy populations of the moth can now be found in over 1 million acres of larch forests. In 1967, the insect was found in the Okanogan Valley in north central Washington and in Garfield and Asotin Counties in southeastern Washington. The infestations are expected to continue spreading throughout the larch stands in eastern Washington. The parasite, *Agathis pumila* (Ratz.), was released at 11 localities in 1966, and 8 localities in 1967. Further releases are planned in 1968.

[1] Based on cooperative surveys with Oregon State Department of Forestry and Washington State Department of Natural Resources.

Larch sawfly, *Pristiphora erichsonii* (Htg.). Larch sawfly infestations continued in both Oregon and Washington. Damage increased in northeastern Washington, but decreased in larch stands of the Cascade Mountains in Oregon. Tree mortality has not occurred from the defoliation, nor is any foreseen now. The infestations are expected to increase in size and number in Washington, and to remain static in Oregon.

Larch bud moth, *Zeiraphera griseana* (Hbn.). This moth caused widespread light to heavy defoliation in north central Washington—over nearly 140,000 acres in the Okanogan and Colville National Forests, and the Colville Indian Reservation. Since most outbreaks are short-lived, control will not be necessary in 1968.

Western hemlock looper, *Lambdina fiscellaria lugubrosa* (Hulst). Very heavy defoliation occurred on 1,600 acres of western hemlock in the Bacon Creek drainage on the Mount Baker National Forest, Wash. Fall egg surveys indicate the infestation is spreading and building up at several widely scattered locations on the Forest. Defoliation is expected in 1968 in the Cascade River, Finney Creek, and Whitehorse Mountain areas, with some tree mortality in the heavily defoliated areas.

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Egg of western hemlock looper deposited on a moss strand (greatly enlarged).

Needle miner, *Coleotechnites* sp. near *milleri*. The widespread needle miner outbreaks in the ponderosa and lodgepole pine stands of central Oregon decreased in extent while increasing in intensity. The infestation is expected to continue decreasing; however, tree killing is anticipated in some of the most heavily defoliated areas.

European pine shoot moth, *Rhyacionia buoliana* (Schiff.). Ornamental pine trees in 83 communities and growing stock in 44 Christmas tree plantations were surveyed outside the containment zone of western Washington. Infested trees were found in Longview, Tenino, College Place, Kennewick, and Walla Walla. The moth continued to spread and tree damage intensified in the containment zone.

In Oregon, infested trees were found west of the Cascade Mountains at two locations in Portland. Well-established infestations were detected at Hermiston, Umatilla, and at McNary Dam east of the Cascade Mountains. All infested trees in the Portland area were fumigated or destroyed before moth flight. All other infestations outside the containment zone are being studied before control action is recommended.

Balsam woolly aphid, *Chermes piceae* Ratz. Losses increased in the grand fir stands in the coastal mountain range of southern Oregon, and in the subalpine fir stands in the Cascade Mountains of central Oregon. Losses also increased in the Pacific silver and subalpine fir stands in Washington. Most of the damage occurred on the Gifford Pinchot and Snoqualmie National Forests. Direct control is impractical under forest conditions. Logging of infested merchantable trees is being done where possible.

Douglas-fir beetle, *Dendroctonus pseudotsugae* Hopk. Tree killing increased in most areas of Washington. Severe tree killing is occurring in localized areas on the Okanogan, Colville, and Gifford Pinchot National Forests, and on the Colville Indian Reservation. Losses remained static in western Oregon and decreased in eastern Oregon. Serious killing occurred on the Illinois Valley District, Siskiyou National Forest. Additional

losses were reported on the Rogue River, Siuslaw, Umpqua, and Wallowa-Whitman National Forests. Losses are expected to remain static, or increase slightly in 1968.

Engelmann spruce beetle, *Dendroctonus obesus* (Mann.) (*D. engelmanni* Hopk.). Tree killing in the Engelmann spruce stands declined in both Oregon and Washington. Minor losses, mostly in inaccessible stands, occurred on the Okanogan National Forest in Washington, and on the Wallowa-Whitman and Umatilla National Forests in Oregon. No major outbreaks are expected in 1968.

Fir engraver, *Scolytus ventralis* LeC. Damage to true fir stands increased in Oregon but decreased in Washington. Most of the damage occurred in small outbreak areas in the mature and overmature stands on the Wallowa-Whitman and Umatilla Forests. The trend is expected to be higher in 1968 due to the 1967 drought conditions.

Mountain pine beetle, *Dendroctonus ponderosae* Hopk. (*D. monticolae* Hopk.) Mountain pine beetle outbreaks in western white pine increased slightly in Washington, where most of the damage occurred on the Olympic National Park, on the Quinault Indian Reservation, and on the Snoqualmie, Gifford Pinchot, and Wenatchee National Forests. Losses increased in the western white pine stands on the Willamette and Umpqua National Forests in Oregon. Tree mortality is expected to remain high in 1968.

Tree killing in lodgepole pine is at a very low level in Washington, but serious tree killing is occurring in Oregon on the Deschutes, Fremont, and Winema National Forests. The trend of damage to lodgepole pine is expected to continue high in Oregon and low in Washington.

Losses in stagnated, pole-sized ponderosa pine stands remained high on the Okanogan National Forest, Wash. Tree killing decreased in Oregon, but significant losses still occurred on the Fremont, Wallowa-Whitman, and Malheur National Forests. Losses will continue to be high in 1968.

Mountain pine beetle outbreaks in sugar pine were fewer in 1967, with minor losses occurring on the Rogue River National Forest, Oreg.

Direct control of the mountain pine beetle has not been practical in western white, lodgepole, and sugar pine stands. Logging merchantable infested and intermingled green trees is being done wherever possible to reduce the beetle populations. Direct controls have been used in some stagnated ponderosa pine stands.

Pine engraver, *Ips pini* (Say). The size and intensity of pine engraver infestations increased in Oregon, reaching epidemic proportions on the Wallowa-Whitman National Forest. In Washington, minor losses occurred on the Okanogan National Forest. Additional damage can be expected next year in fire-scorched trees and in fringe-type stands suffering from drought.

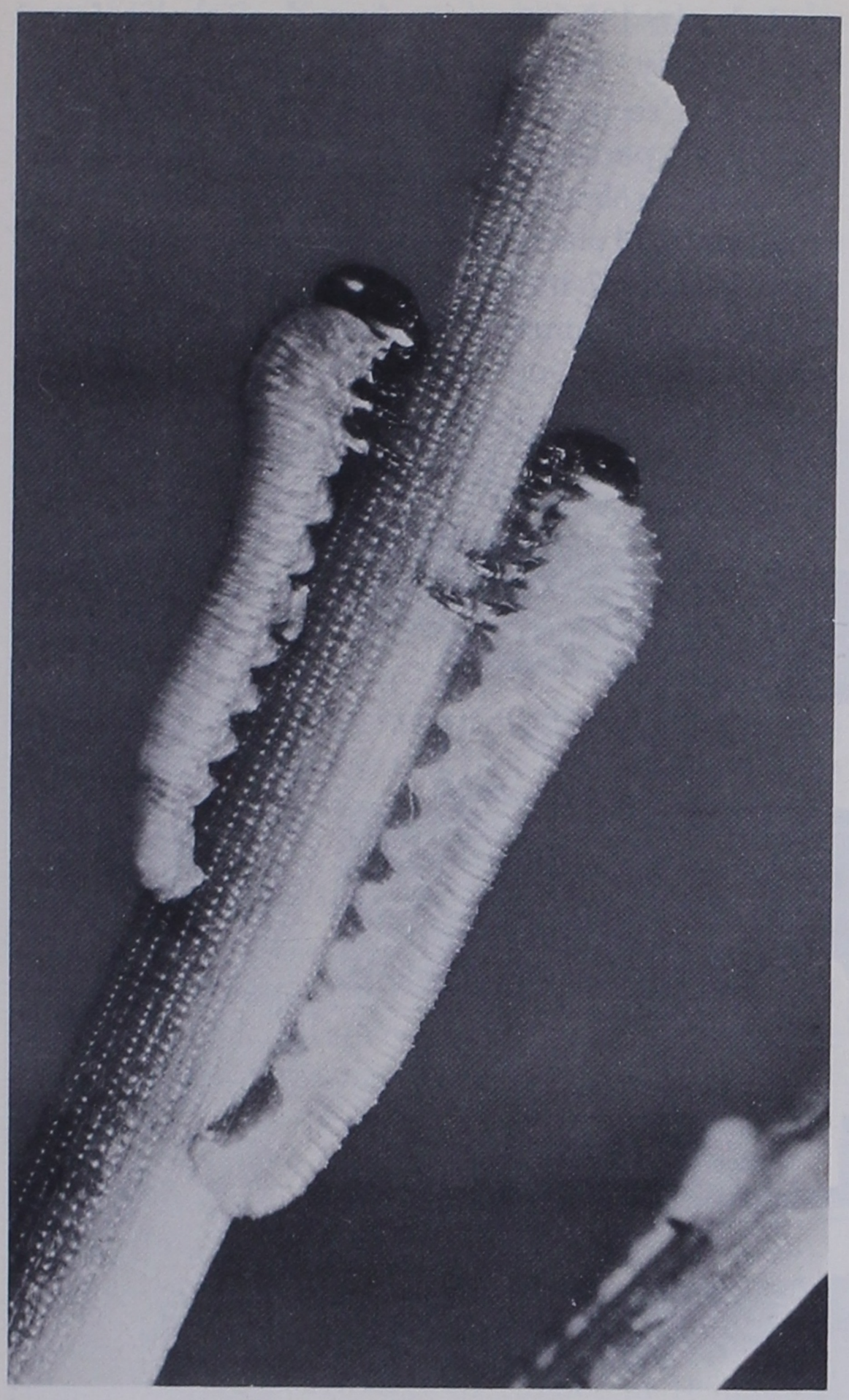
Silver fir beetles, *Pseudohylesinus* spp. Minor epidemic damage occurred in several overmature silver fir stands on the Mount Baker and Snoqualmie National Forests in Washington. Many infested areas are also heavily infected with *Armillaria mellea* Vahl ex Fr. root rot. Rapid salvage of distressed timber in these areas is the only control being applied. No serious outbreaks are expected in 1968.

Western pine beetle, *Dendroctonus brevicomis* LeC. Epidemic conditions increased in Oregon and decreased in Washington. Most of the losses occurred on the Malheur, Fremont, Ochoco, and Rogue River National Forests in Oregon. Increased losses are expected in all areas in 1968. Intensified sanitation-salvage programs in overmature ponderosa pine stands will hold tree killing to a minimum.

Other insects. Very light populations of the black-headed budworm, *Acleris variana* (Fern.), exist on the Mount Hood National Forest in Oregon, and on the Gifford Pinchot National Forest and the Yakima Indian Reservation in Washington. Elsewhere this insect was more prevalent than normal, but caused no damage. Populations are expected to increase in 1968. Evaluation surveys of the overwintering egg populations are underway.

Hemlock sawfly, *Neodiprion tsugae* Midd., caused very light defoliation in localized areas on the Bear Springs District, Mount Hood National Forest, Oreg., and around Spirit Lake on the Gifford Pinchot National Forest, Wash. High cocoon parasitism is expected to decrease population in 1968.

Two species of *Neodiprion* sawflies caused moderate damage on about 4,000 acres of true fir timber on the Winema and Mount Hood National Forests, Oreg. Serious defoliation in these areas is not expected in 1968. Light to heavy defoliation



F—518128

Young larvae of *Neodiprion* sawfly on knobcone pine needle. This pest caused heavy defoliation on the Siskiyou National Forest, Oreg.

of knobcone pine occurred on the Siskiyou National Forest, Oreg. The infestation trend is expected to be static to decreasing in 1968.

A tent caterpillar, *Malacosoma* sp., caused moderate to heavy defoliation in scattered red alder stands in the Coast Range from the Columbia River south to the Coquille River in Oregon.

Outbreaks of the Great Basin tent caterpillar, *Malacosoma fragile* (Stretch), occurred on several thousand acres on the Winema and Deschutes National Forests in central Oregon. Although defoliation ranged from light to extreme in the spring, most plants had refoliated by fall. A virus present in the population should bring about the collapse of the outbreak in 1968, but not before another season of feeding causes additional defoliation and twig killing.

Feeding damage by mites resulted in light to moderate defoliation of the current year's foliage in a 56-year-old Douglas-fir plantation near Hebo Mountain on the Siuslaw National Forest, Oreg. The trend of this outbreak is unpredictable.

Light damage from the Douglas-fir twig weevil, *Cylindrocopturus furnissi* Buch., occurred in a seed orchard on the Willamette National Forest, Oreg. Drought-weakened trees elsewhere in the Williamette Valley and in western Washington were attacked, hastening top killing in some young trees.

The alder flea beetle, *Altica ambiens* LeC., lightly defoliated several alder stands along the western slopes of the Coast Range in Oregon. The elm leaf beetle, *Pyrrhalta luteola* (Müller), was found feeding on ornamental elms in several communities in Oregon.

CALIFORNIA

By JOHN R. PIERCE, *Division of Timber Management San Francisco, Calif.*

Conditions in Brief

Tree killing of ponderosa and sugar pine by bark beetles increased in several areas of California in 1967. This increase resulted from many scattered outbreaks of western pine beetle and mountain pine beetle in the north. The lack of measurable rainfall from early spring through October 1966 may have contributed to the development of these outbreaks.

The red turpentine beetle and the fir engraver were also more abundant than in 1966.

Despite increased bark beetle damage in pine and white fir, the overall picture improved with the decline of the Douglas-fir beetle epidemic in California's north-coastal Douglas-fir forests. This catastrophic epidemic, which killed an estimated gross volume of 796 million board feet of old-growth Douglas-fir trees on 1.6 million acres in 1966, subsided in 1967.

Damage to pine by engraver beetles declined to a low level in 1967.

Tip killing of young ponderosa pine by a resin

midge increased, and caused conspicuous flagging throughout the ponderosa pine type in central and northern California.

Status of Insects

Western pine beetle, *Dendroctonus brevicomis* LeC. Tree killing by the western pine beetle extended over 133,000 acres of ponderosa pine forest immediately west of Trinity Lake in Trinity County. Precipitation in this area was approximately 50 percent below normal between February and October 1966, and moisture stress of the trees probably triggered this outbreak. Ground surveys in 1967 indicated tree mortality reached a peak in midsummer and then declined in late sum-

F—518123

X-ray pictures of ponderosa pine bark samples help determine population trends of the western pine beetle. Beetles hidden beneath the bark are counted on the X-ray. (San Francisco, Calif.)

mer and fall. X-ray analysis of bark samples showed the population density of this pest had declined to a low level.

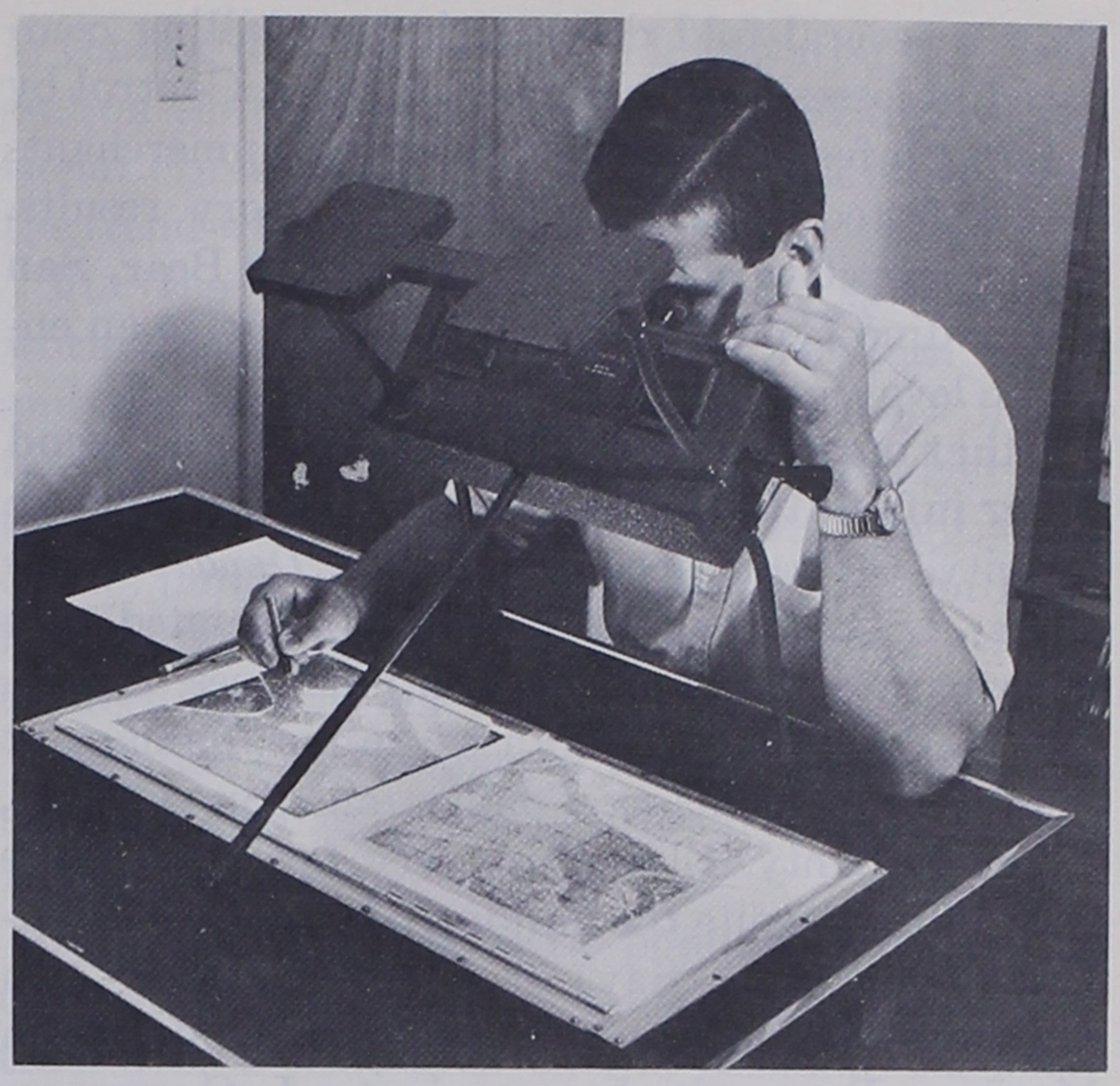
Another outbreak of western pine beetle occurred on approximately 5,000 acres of dense 60- to 80-year-old ponderosa pine pole stands on the McCloud Flats, Siskiyou County. During midsummer, large groups of trees were killed. The overwintering bark beetle population remains high, and tree killing probably will increase in 1968. On the Mendocino National Forest, an infestation is centered in the Indian Dick and Keller Lake areas. An evaluation made in October indicates a decline in the number of infested trees, but X-rayed bark samples showed high overwintering populations.

The southern Sierras, which suffered serious storm damage during the 1966–1967 winter, were also affected by western pine beetle outbreaks in Kern, Tulare, and Fresno Counties. Overwintering beetle populations were high, and direct control work is planned in 1968. Further north, infestations at Miami Creek and the South Fork of Willow Creek, Madera County, subsided after direct control treatment.

In southern California the activity of the western pine beetle was the lowest in recent years.

Douglas-fir beetle, *Dendroctonus pseudotsugae* Hopk. The Douglas-fir beetle epidemic in northwestern California declined suddenly in 1967 after killing 249,000 mature trees with a gross volume of 796 million board feet of timber in 1966. This decline was forecast by surveys made late in 1966 and was confirmed by more comprehensive surveys conducted in July 1967. Surveillance is continuing in the affected stands. By the end of the 1968 field season, the Forest Service expects to recover 470 million board feet of the loss through salvage timber sales.

Mountain pine beetle, *Dendroctonus ponderosae* Hopk. (*D. monticolae* Hopk.) Killing of sugar pine by the mountain pine beetle, noticeable in recent years, increased in 1967. In some locations on the Middle Fork of the Feather River in Plumas County, the killing of groups of advanced reproduction and individual mature trees was epidemic. The death of individual mature trees and groups of poles and small sawtimber trees was common in Shasta County. Other losses occurred in Tehama, Trinity, Placer, and Butte Counties.



F–518126

Photogrammetric techniques were used in determining the volume of timber to be salvaged in the aftermath of a Douglas-fir beetle epidemic in northwestern California.

Sugar pine mortality increased in numerous other locations from the Sequoia National Forest northward.

Mountain pine beetle activity in lodgepole pine declined in 1967, but a few infestations persist. In the Medicine Lake Recreation Area, Siskiyou County, and Warner Valley, Plumas County, there was a continuing but less severe problem than in 1966. A continuing and possibly increasing infestation exists near the South Shore of Lake Tahoe.

Fir engraver, *Scolytus ventralis* LeC. After 2 years of inactivity, an increase in tree killing by this insect was conspicuous in white fir stands during 1967. Increased losses in stands defoliated by the Douglas-fir tussock moth in 1964 and 1965 were reported at Knox Mountain and Cedar Pass, Modoc County. In other areas, group-killing occurred in El Dorado County; the Tahoe Valley Basin; Bear Valley, Placer and Nevada Counties; and Sardine Lookout, Sierra County.

Jeffrey pine beetle, *Dendroctonus ponderosae* Hopk. (*D. Jeffreyi* Hopk.). Losses from the Jeffrey pine beetle declined in 1967. Decreasing populations still remain at scattered locations in Shasta, Lassen, and Plumas Counties. These infestations

show a several-fold decrease in tree killing compared to losses during the past 2 years. Control by logging infested trees and spraying unmerchantable infested material gave satisfactory results. The cooperative control project at Big Bear, San Bernardino County, reduced tree killing to an endemic level.

Other bark beetle, flatheaded borer, and wood borer infestations. Following a period of relative scarcity, the red turpentine beetle, *Dendroctonus valens*, LeC., was again commonly associated with other bark beetles in attacks on pine trees. Engraver beetles, *Ips* spp., caused minor damage at Smoky Cabin, Shasta County, and Snow Lake, Plumas County. Elsewhere, very few green trees were killed despite the buildup of abundant populations of *I. pini* (Say) or *I. confusus* (LeC.) in slash on stand improvement projects. At Mountain Meadows Reservoir, *I. emarginatus* LeC., was associated with the Jeffrey pine beetles in attacks on Jeffrey pine poles and saplings.

The California flatheaded borer, *Melanophila californica* Van Dyke, has become the most serious insect tree killer in southern California, but infestations of this beetle are decreasing as a result of direct control efforts and increased rainfall. The severest remaining outbreak was in Jeffrey pine at Laguna Mountains, San Diego County. Twig beetles, principally *Pityophthorus* spp., in various species of pine, increased in 1967. The damage was not serious, and the infestations were probably the result of the 1966 drought.

Damage by wood borers became more noticeable as the salvage programs to harvest fire- and beetle-killed timber accelerated. Fire-damaged trees in the Round Mountain Burn on the Mendocino National Forest now contain dense populations of roundheaded and flatheaded borer larvae, which are penetrating deep enough into the wood to degrade lumber. In some cases, these borers have apparently contributed to the death of fire-injured trees by constructing galleries into green portions of the cambium as well as in deadened areas. An increasing volume of Douglas-fir salvaged from the 1966 beetle epidemic now contains ambrosia beetles. The pinholes and stain caused by these beetles are of increasing concern to mill operators.

Defoliating insects. Damage caused by insect defoliators of conifers was quite limited in 1967. The lodgepole needle miner, *Coleotechnites milleri* (Busck), infestation at Tuolumne Meadows, Yosemite National Park, declined to the lowest known level in 20 years. The smaller infestations on Woods Creek, Sequoia and Kings Canyon National Parks, and Sentinel Meadows, Mono County, continued at a generally light population level.

The persistent localized outbreak of the Jeffrey pine needle miner, *Coleotechnites* sp., at Snow Valley, San Bernardino County, expanded slightly in 1967, with no tree mortality.

The white-fir needle miner, *Epinotia meritana* Hein., continued to defoliate red fir on the Yosemite and Sequoia and Kings Canyon National Parks and on the Sierra National Forest. Thinning of the crown in affected trees was noticeable, but the trees have maintained good vigor.

Unusual numbers of adults of the pine butterfly, *Neophasia menapia* (Feld. & Feld.), were reported from both pine and Douglas-fir areas, but no defoliation was apparent. Likewise, numerous phantom hemlock looper, *Nepytia phantasmaria* (Strecker), adults were collected south of McCloud in Shasta County, but only slight defoliation was reported. A matsucoccus scale, probably *Matsucoccus paucicicatrices* Morrison, seriously depressed the growth of sugar pine in a localized area along the Calaham-Cecilville Highway in Siskiyou County. *M. fasciculensis* Herb. damaged Jeffrey pine on 200 acres in Mono County.

Defoliators of hardwood trees caused concern in several areas, mainly due to the damage inflicted on ornamental and shade trees. The most widespread and damaging one, the California oakworm, *Phryganidia californica* Pack., declined in 1967, but continued defoliating oak in numerous areas. Oak trees also suffered from attacks of the fruit tree leaf roller, *Archips argyrospilus* (Wlk.). The elm leaf beetle, *Pyrrhalta luteola* (Müller), was unusually abundant in many parts of the State. The alder flea beetle, *Altica ambiens* LeC., stripped alder trees in the Hat Creek and Cow Creek drainages of Shasta County, and at Lake Arrowhead, San Bernardino County.

Insects of young trees. An outbreak of a pine resin midge, *Cecidomyia piniinopis* (O.S.), was widespread and damaging in most northern California pine areas in 1967. Reports on this general outbreak were received from Tuolumne, El Dorado, Mariposa, Shasta, Butte, Nevada, Placer,

F—518124

Larvae of a pine resin midge. This pest caused severe tip killing of young ponderosa pine in northern California.

and Modoc Counties. A Douglas-fir gall midge, *Contarinia* sp., was very common in the Red Cap Creek and Ti Creek drainages of Siskiyou County.

INTERMOUNTAIN STATES [1]

By WILLIAM H. KLEIN, *Division of Timber Management Ogden, Utah*

Conditions in Brief

Excepting the mountain pine beetle, forest insect problems in the Intermountain States were extremely low. That beetle continued to deplete large areas of lodgepole pine throughout southern Idaho, western Wyoming, and northern Utah. However, the end of this destructive outbreak is finally in sight. Although serious tree killing will continue in all infested areas—and some areas show a definite tendency for increase—an overall reduction in total tree killing will occur. Probably the most significant decline of mountain pine beetle infestation is in the Teton Wilderness where, just 2 years ago, over 1 million trees were attacked and killed. Other notable decreases were observed on portions of the Teton National Forest and adjoining Bureau of Land Management lands, in the Wyoming division of the Bridger National Forest, and on the Rexburg District of the Targhee National Forest in eastern Idaho. In most other areas the trend will be static to increasing.

For the second consecutive year, spruce budworm defoliation remained low in southern Idaho and southern Utah, but it increased both in intensity and extent in one area on the Bridger National Forest in western Wyoming. Egg mass counts indicate moderate to heavy budworm feeding in the Bridger infestation in 1968, but negligible feeding elsewhere.

Windthrown Douglas-fir triggered a potentially serious Douglas-fir beetle infestation in southern Idaho.

Engelmann spruce beetle populations reared in old windthrow emerged, and attacked standing trees over a wide area on the Fishlake National Forest in southern Utah.

Engraver beetle populations continued to kill young ponderosa pine in southern Idaho but show signs of abating.

Most other insect pests of Intermountain forests and rangelands were active but remained at endemic levels.

Status of Insects

Mountain pine beetle, *Dendroctonus ponderosae* Hopk. (D. *monticolae* Hopk.). The almost continuous sea of red-topped lodgepole pine, the result of a relentless mountain pine beetle outbreak that seemed endless, finally appears to be diminishing. The huge outbreak in the Teton Wilderness of western Wyoming, which showed signs of lessening in 1966, declined even further in 1967. In other parts of the Teton National Forest, and in Grand Teton National Park, where several years' control efforts were terminated, tree killing continued, but below the 1966 level. Even greater reductions occurred on the Teton Forest in the Hoback drainage, including the once serious infestation surrounding Kismet Peak on adjacent BLM, State, and private lands. With only minor exceptions, less tree killing is predicted in all areas during 1968.

On the Targhee National Forest in eastern Idaho, tree killing continued on a massive scale, but there were signs of a respite in some areas. The most dangerous infestation was on the western slope of the Grand Teton Range, where more than 550,000 trees were chemically treated and another

[1] Includes forested lands in Utah, southern Idaho, western Wyoming, and Nevada.

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40,000 removed by logging. New attacks were reduced in some of the treated areas; in others, some buildup occurred. Most of the new attacks probably resulted from beetle invasion from adjoining untreated areas.

Control efforts, however, were not sufficient to halt the spread of the beetle into adjoining Yellowstone National Park, where new attacks increased considerably in 1967. Tree killing declined along the northern edge of the Forest and to the south in the heavily damaged Rexburg District. Biological evaluations indicate even greater reductions in beetle activity in these two areas in 1968. Elsewhere, the infestation level will be static or increasing, and control by chemicals and logging will continue in the areas of heaviest attack.

Obviously the ultimate solution to the mountain pine beetle problem in lodgepole pine stands is the application of sound forest management principles—logging infested and susceptible stands to break up the almost continuous expanse of overmature lodgepole, and to transform the stands as rapidly as possible to a young, vigorous state. Future efforts will minimize individual tree control and place greater emphasis on expanded timber harvest.

There were less serious, but important, mountain pine beetle infestations elsewhere in the Region. Damaging losses occurred along the lower edge of the Bridger Wilderness in western Wyoming; even greater losses are expected in 1968. However, woodpeckers and other natural enemies were responsible for a general decline along the lower Greys River on the Bridger Forest.

Mountain pine beetle damage remained unchanged on the Caribou and Sawtooth National Forests in southern Idaho. The Caribou infestation shows signs of weakening, but conditions will continue static on the Sawtooth. Natural control factors decreased tree killing on the Cache National Forest in southern Idaho and nothern Utah. A small, but potentially serious, outbreak in mixed lodgepole and ponderosa pine developed on private land near McCall, Idaho, and may be a threat to nearby pine stands on the Payette National Forest. Tree killing by the mountain pine beetle on the Ashley and Wasatch National Forests remained at endemic levels.

A persistent infestation continues to kill between 2,000 and 3,000 ponderosa pine yearly on State and private lands near Cascade, Idaho. Biological data indicate a static trend for 1968; no control is planned.

Spruce budworm, *Choristoneura fumiferana* complex. The spruce budworm population decline which began in 1965 continued. Areas with a history of reported heavy defoliation, like the Salmon, Challis, and Boise National Forests in southern Idaho, experienced only negligible damage over relatively small areas. The dynamic infestation on the Sawtooth Forest, which fluctuated in intensity and extent of defoliation during recent years, all but disappeared. Almost no defoliation was visible in past budworm areas on the Targhee National Forest in eastern Idaho and the Fishlake National Forest in Utah.

The one exception to this Region-wide decline was in the Greys River drainage on the Bridger National Forest in western Wyoming, where both size of infested area and degree of defoliation increased. No control is planned even though greater damage is expected to occur in this area in 1968.

Douglas-fir beetle, *Dendroctonus pseudotsugae* Hopk. Drenching rains followed by strong winds during the winter of 1964–65 caused scattered windthrow of Douglas-fir over portions of the Boise and Payette National Forests. This blowdown produced aggressive broods which attacked standing trees in 1966, causing damage that was not visible from the air until the spring of 1967. Logging the infested timber in concentrated areas will minimize future tree losses, but control by logging or other methods is not practical over most of the area because of the scattered state of the infested timber.

The chronic infestation on the Sublette Division of the Sawtooth National Forest remained epidemic, but past, present, and future harvesting of overmature Douglas-fir should reduce losses in 1968. Most of the infestation centers on the Cache, Caribou, Fishlake, and Dixie National Forests continued to subside, leaving the Utah infestation at its lowest level in 10 years.

Engraver beetles, *Ips* spp., had remained at a low level until 1966 when several factors favorable to their buildup caused widely scattered killing of young ponderosa pine throughout southern Idaho. Heavy killing occurred again in 1967 on portions of the Boise, Payette, and Sawtooth National

Forests, but tree groups were smaller and fewer, indicating a decline for 1968.

Engelmann spruce beetle, *Dendroctonus obesus* (Mann.) (*D. engelmanni* Hopk.). Aerial surveys revealed a large outbreak of this beetle in inoperable spruce on Hilgard Mountain on the Fishlake National Forest in Utah. Ground examinations showed the infestation to be epidemic on over 2,000 acres of 1961 blowdown. The beetle is well established in standing spruce and will persist at epidemic levels until most of the larger spruce is killed. Although no control is planned, the infestation will be closely watched as a threat to nearby, operable spruce timber.

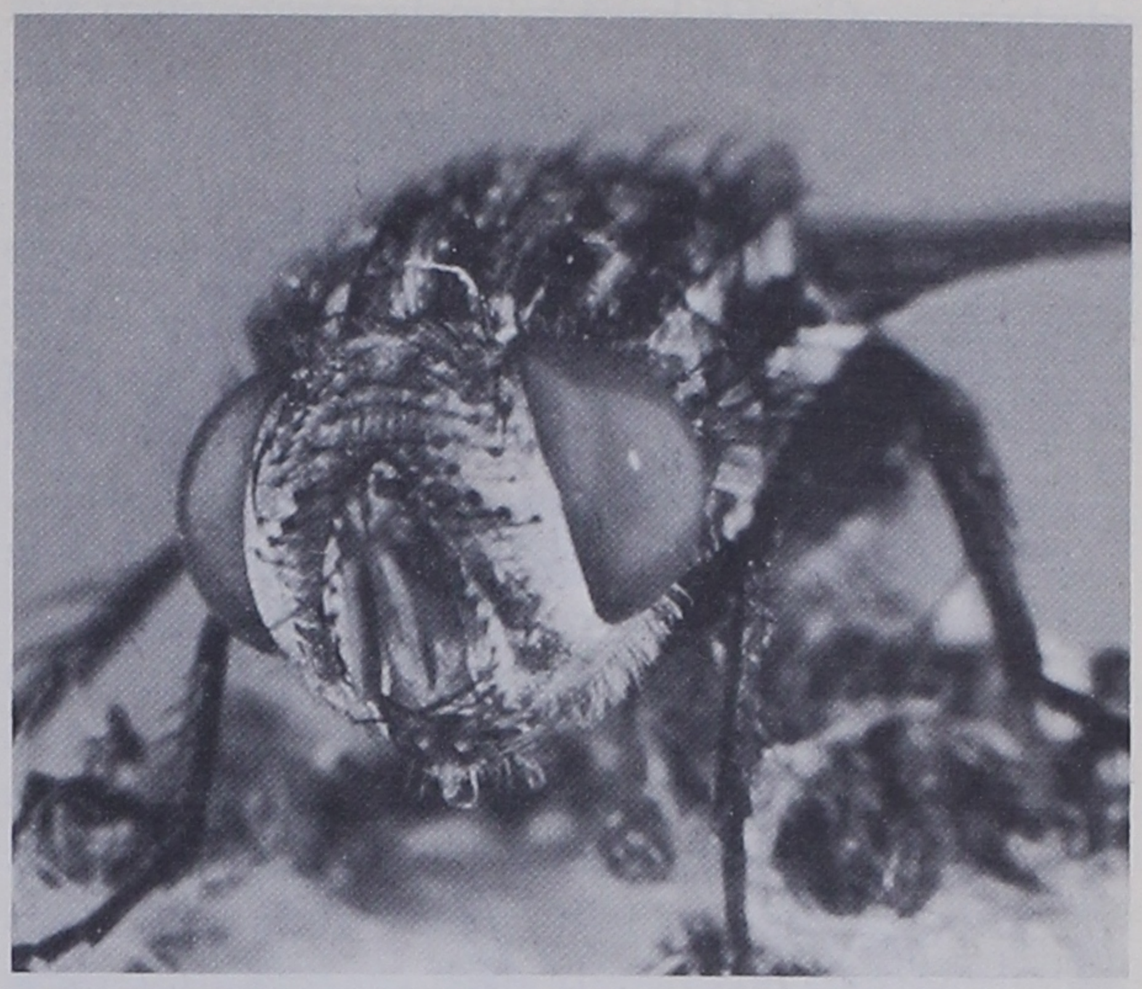
A heavy concentration of this beetle has built up in log decks alongside new road construction on the Payette National Forest. Removal of these logs before beetle emergence in 1968 will eliminate a potential hazard.

Douglas-fir tussock moth, *Hemerocampa pseudotsugata* McD. Natural enemies, including a native virus, have kept this defoliator in check for several years. The one remaining infestation in Owyhee County in southern Idaho, which started to decline in 1966, was reduced to an even lower level in 1967.

A sawfly, *Neodiprion edulicolus* Ross. During the height of the outbreak in 1965, this insect defoliated pinyon pine on more than 250,000 acres in southeastern Nevada. Natural factors, including a sequence of untimely frosts, reduced the 1966 population to a level where parasites and predators were able to exert control. In 1967, feeding was light and widely scattered, and the area of infestation much reduced. An analysis of pupal counts indicates even lighter activity in 1968.

Sugar pine tortrix, *Choristoneura lambertianae* (Busck), which extensively defoliated lodgepole pine in 1966 in southeastern Idaho and southwestern Wyoming, was barely visible during aerial surveys. Ground checks showed very little activity except in a few areas on the Targhee National Forest, Idaho, including the persistent infestation west of Bishop Mountain, which has a history of repeated heavy defoliation.

A tent caterpillar, *Malacosoma* sp., continued to defoliate Fremont poplar along the Virgin River in southwestern Utah, but not as severely as in 1966. Light to moderate populations appeared in Zion National Park, but foliar protection in campgrounds was accomplished with mistblower application of *Bacillus thuringiensis* (Berliner), a microbial insecticide. Egg mass surveys indicate even less defoliation in 1968.



F—518122

Face of a friend. This fly, *Chaetogaedia monticola* (Big.) is a predator on the tent caterpillar, a defoliator of Fremont poplar in southwestern Utah.

A white-fir looper, *Nepytia freemani* Munroe. The predicted decline of this geometrid occurred on white fir in Timpanogos Cave National Monument and on the Uinta National Forest in northern Utah. Entomologists and Monument rangers searched for evidence of this insect but not one larva, pupa, or moth was found. Most of the affected trees, regardless of defoliation history, appeared to make almost complete recovery.

Other insects. Populations of the white-fir needle miner, *Epinotia meritana* Hein., were active on a small scale in one area on the Dixie National Forest and Bryce Canyon National Park in southern Utah. Also on the Dixie Forest, the grass plant bug, *Labops hesperius* Uhler, was aerially sprayed with malathion to prevent serious damage to crested wheatgrass. The pinyon needle scale, *Matsucoccus acalyptus* Herb., continued to feed on pinyon pine in localized areas throughout southern Utah. The black-headed budworm, *Acleris variana* (Fern.), defoliated Douglas-fir and alpine fir in one location on the Caribou National Forest in Idaho. Widely scattered outbreaks of the forest tent caterpillar, *Malacosoma disstria*

F–518121

The predacious ladybird beetle, *Anatis lecontei*, helped reduce populations of a white-fir looper in northern Utah.

Hbn., on a variety of browse plants were reported on the Caribou and Cache National Forests. Another tent caterpillar, *Malacosoma* sp., heavily defoliated several thousand acres of bitterbrush, a valuable wildlife forage plant, on the Monroe unit of the Fishlake National Forest. Populations of a geometrid, *Anacamptodes clivinaria* (Guenee), on mountain mahogany in Owyhee County, Idaho, declined as had been expected. The tiger moth, *Halisidota ingens* Hy. Edw., defoliated the tops of young ponderosa pine on the Manti-LaSal National Forest near Blanding, Utah.

For the third consecutive year, a terminal weevil, *Pissodes* sp., damaged lodgepole pine reproduction areas on the Sawtooth Forest in Idaho and on the Ashley Forest in Utah. *Dendroctonus adjunctus* (Blandf.) was the primary killer of mature ponderosa pine in a localized outbreak on the Toiyabe National Forest near Las Vegas, Nev. Populations of a mealybug, *Puto* sp., continued to infest Englemann spruce in localized areas of the Dixie and Fishlake National Forests in Utah.

NORTHERN ROCKY MOUNTAINS [1]

By Frederick W. Honing, Scott Tunnock, and Mark D. McGregor, *Division of State and Private Forestry, Missoula, Mont.*

Conditions in Brief

Outbreaks of the mountain pine beetle, which increased in lodgepole and ponderosa pine stands in Montana, were most severe in ponderosa pine on the Lewis and Clark and the Helena National Forests. Populations of these beetles increased in two lodgepole pine stands near St. Regis, Mont., and continued to kill mature western white pine in northern Idaho.

The pine engraver killed more than 25,000 ponderosa pine along major drainages of the Clark Fork and Kootenai Rivers in northwestern Montana and northern Idaho.

Spruce budworm activity decreased in Montana east of the Continental Divide. West of the Divide, infestations increased in size and spread both north and west. Heavy defoliation occurred throughout the Lolo National Forest, Mont.

Larch casebearer infestations spread eastward into the Bitterroot Valley and up the main Clark Fork River east of Missoula.

Infestations of the larch bud moth decreased from 518,000 to 110,000 acres in Montana. The sugar pine tortrix extensively defoliated lodgepole pine stands in Montana and Idaho, and in Yellowstone National Park, Wyo. Natural factors reduced populations of the larch sawfly to endemic levels. Seed and cone insects destroyed much of the Douglas-fir seed crop in some areas of eastern Montana. The Engelmann spruce weevil caused moderate to heavy terminal killing of Engelmann spruce reproduction and saplings within open-grown spruce reproduction sites in northern Idaho and western Montana. Blackheaded budworm infestations continued to decrease in northern Idaho and in

[1] Includes forested lands in Montana, northeastern Washington, northern Idaho, North Dakota, northwestern South Dakota, and National Park Service land in northern Wyoming.

Montana. Tent caterpillars caused moderate to heavy defoliation on chokecherry, alder, elderberry, and other shrubs throughout the region. A pine tussock moth outbreak in the Ashland, Mont., area has subsided and now affects only 200 acres.

Mountain pine beetle, *Dendroctonus ponderosae* Hopk. (*D. monticolae* Hopk.). Damage by the mountain pine beetle has increased in ponderosa pine stands in eastern Montana since 1963. Approximately 2,000 trees are currently infested near Monarch Mountain on the Belt Creek District, Lewis and Clark National Forest. Infestations are also prevalent within the Judith River drainage, southeast of Lewistown, and along the foothills of the Big and Little Snowy Mountains. Many groups containing 5 to 100 dying ponderosa pine were detected on the Helena National Forest. In western Montana, many ponderosa pine trees top-killed by the pine engraver, *Ips pini* (Say), contained mountain pine beetle broods. These infestations extended north along the Bitterroot and Clark Fork Valleys from Darby to Trout Creek, Mont. For the past several years, populations have increased in two lodgepole pine stands on State and private lands near St. Regis, Mont. Approximately 5,000 trees on about 600 acres are infested. Infestations are still active near the mouth and along both shores of the Hungry Horse Reservoir, Mont. These infestations have been present since the early 1960's and will probably kill most of the mature western white pine there.

The problem in mature western white pine stands on the Kaniksu, Coeur d'Alene, St. Joe, and Clearwater National Forests, Idaho, has not changed for many years. This beetle kills 1 to 2.5 percent of the mature timber each year.

Mountain pine beetle damage is expected to continue in all infested areas during 1968.

Pine engraver, *Ips pini* (Say). The decline predicted for 1967 did not occur.

A hot, dry spring and summer as in 1966 may have contributed to the buildup of engraver beetles in slash and in green trees in western Montana. Groups of 5 to 1,000 trees were recently killed along the Clark Fork River from Frenchtown, Mont., west to St. Regis, Mont. Major outbreaks occurred along the Bitterroot River Valley south of Missoula. Logging and tree disturbance, resulting from construction of the Libby Dam, contributed to a buildup of beetle broods in weakened trees along the Kootenai River.

A chronic infestation still persists along the eastern side of the Salmon River south of Grangeville, Idaho. Engraver beetle activity in lodgepole pine continued west of Careywood and north of Hayden Village near Coeur d'Alene, Idaho.

Losses from pine engraver may continue at about the same level in 1968.

Spruce budworm, *Choristoneura fumiferana* complex. The old spruce budworm epidemic in Montana was still active. The heaviest and most extensive damage occurred on the Helena National Forest; the infestation there has been great for many years. However, damage has steadily decreased in the past several years on the Deerlodge, Beaverhead, Custer, and Lewis and Clark National Forests. Scattered infestations were observed along the Yellowstone and Boulder River drainages on the Gallatin National Forest. West of the Continental Divide, damage decreased on the southern part of the Bitterroot National Forest, but it increased on the northern part. Infestations increased on the Lolo National Forest and spread north into the Flathead National Forest and west into northern Idaho.

An outbreak, which heavily damaged the eastern half of the Nezperce National Forest, Idaho, spread steadily towards the west. An infested area of about 12,000 acres of grand fir and spruce increased to more than 100,000 acres on the Powell District, Clearwater National Forest, Idaho.

Budworm damage increased slightly in the northwestern corner of Yellowstone National Park, Wyo. About 10,000 acres were infested.

Budworm infestations are expected to again spread north and west in 1968.

Larch casebearer, *Coleophora laricella* (Hbn.). Epidemic infestations of the larch casebearer continued to spread through larch stands of the northern Rockies—north into British Columbia, east to the Flathead and Bitterroot Valleys in Montana, south almost to the Salmon River in Idaho, and west as far as the Columbia River in eastern Washington. Tree mortality is occurring after 10 years of heavy defoliation near St. Maries and Idaho Falls, Idaho. However, the complexes which may be involved have not yet been identified. Direct control may be needed in areas of high recreational or commercial value.

A casebearer parasite, *Agathis pumila* (Ratz.), has become well established in some release plots. More than 500,000 parasites were released during 1967. Distribution will be continued in 1968.

Sugar pine tortrix, *Choristoneura lambertianae* (Busck). Epidemic populations of the sugar pine tortrix defoliated new growth of lodgepole pine on thousands of acres on the Flathead, Lolo, Bitterroot, and Kootenai National Forests in western Montana; on the Nezperce National Forest, Idaho; and in Glacier and Yellowstone National Parks. Suspected infestations of this insect in conjunction with infestations of the pine needle-sheath miner, *Zelleria haimbachi* Busck, caused moderate to severe defoliation of lodgepole pine on approximately 168,000 acres of the Flathead Forest in 1963. In 1967, heavy defoliation occurred in the Fred Burr Creek drainage, Biterroot National Forest; in the Nezperce National Forest near Grangeville, Idaho; and in the Flathead National Forest near Martin City, Mont. Damage was confined to current growth. New foliage was completely removed in areas of heaviest feeding. Ponderosa pine reproduction and saplings were moderately defoliated on the Flathead Forest near Glacier National Park.

The size of area infested and intensity of defoliation are expected to remain about the same in 1968.

Larch sawfly, *Pristiphora erichsonii* (Htg.). A decrease in size of area infested and number of larch sawflies was observed in larch stands on the Kaniksu, Clearwater, St. Joe, and Nezperce National Forests in Idaho, and on the Kootenai and Flathead Forests in western Montana. Pupal counts showed a significant decrease. Laboratory rearing of overwintering pupae indicated heavy larval parasitism in some localities.

A further decrease is expected in 1968.

Larch bud moth, *Zeiraphera griseana* (Hbn.). Defoliation of larch by this insect decreased from 518,000 to less than 110,000 acres. Light to heavy defoliation was detected on approximately 105,000 acres on the Coram, Hungry Horse, North Fork, and Tally Lake Ranger Districts, Flathead Forest, Mont. Heaviest defoliation occurred in larger trees near ridgetops. Defoliation ranged from 30 percent in the lower crown to 90 percent in the upper one-third of the crown.

Damage is expected to be light throughout the Region in 1968.

Seed and cone insects. Evaluations of nine permanent plots in Montana east of the Continental Divide show that a high percentage of Douglas-fir seed was destroyed by insects, primarily spruce budworm, *Choristoneura fumiferana* complex. Of lesser importance were the fir coneworm, *Dioryctria abietella* (D. & S.); a Douglas-fir cone moth, *Barbara colfaxiana* (Kearf.); Douglas-fir scale midge, *Contarinia washingtonensis* Johnson; and the Douglas-fir seed chalcid, *Megastigmus spermotrophus* Wachtl.

Data is being analyzed to determine the exact amount of seed loss caused by each species. Evaluations of established plots will be continued in 1968. More plots will be set up west of the Divide

F–518037

Spruce budworm larva hollowing out the interior of a Douglas-fir cone. (Gallatin National Forest, Mont.)

to determine insect populations and trends in cones of other tree species.

Engelmann spruce weevil, *Pissodes engelmanni* Hopk. Moderate to heavy terminal killing of Engelmann spruce reproduction and saplings occurred on many open-grown spruce sites. Heaviest damage was observed in Emery and Good Creek drainages, Flathead National Forest, Mont.; and in the Pinkham Creek drainage south of Eureka, Mont. Thirty-five percent of the leaders were killed in some spruce reproduction sites on the Flathead Forest.

Terminal killing was noticeable on the Clarkia and Avery Districts, St. Joe National Forest, Idaho; and in the Beaver and Washington Creek drainages, Clearwater National Forest, Idaho. Dissection of infested terminals showed approximately 18 percent of the weevil population was parasitized by species of Hymenoptera and Diptera. About 36 percent of the broods died in the larval and pupal stages from unknown causes. Methods for evaluating damage and predicting trends are being developed. Terminal killing is expected to be at about the same level in 1968.

Black-headed budworm, *Acleris variana* (Fern.). The area defoliated decreased from 35,000 to 6,000 acres. Infestations were detected on about 4,200 acres of hemlock and subalpine fir in the Lightning Creek area on the Kaniksu National Forest, Idaho. Very light defoliation occurred on 800 acres along O'Brian Creek and on 1,300 acres along Boulder Creek on the Kootenai National Forest, Mont. Infestations are in low-value stands.

Tent caterpillars. Tent caterpillars caused moderate to heavy defoliation of chokecherry, alder, and elderberry throughout Montana and Idaho. *Malacosoma* spp. moderately defoliated chokecherry along the Madison River southeast of Bozeman, Mont., and near Canyon Ferry Dam northeast of Helena, Mont. Noticeable damage and numerous tents of *Malacosoma californicum lutescens* (N. & D.) were observed on chokecherry in the Custer National Forest, near Absarokee, Mont. Elderberry was heavily defoliated by the ugly-nest caterpillar, *Archips cerasivoranus* (Fitch), along the Blackfoot River drainage, Lolo National Forest, Mont. Tent caterpillar populations are expected to remain at about the same level throughout the northern Rockies in 1968.

Fir engraver, *Scolytus ventralis* LeC. This beetle killed additional trees in grand and subalpine fir stands of the Clearwater and St. Joe National Forests, Idaho. However, in most areas damage occurred in inaccessible overmature stands of low commercial value. A small control project was necessary in the Wendover campground, Clearwater Forest, where approximately 80 trees were felled and treated with ethylene dibromide or were removed and burned.

Pine tussock moth, *Dasychira* sp. near or equal *grisefacta* Dyar. Populations of this tussock moth on ponderosa pine were reduced by natural factors on the Custer National Forest. Surveys showed that only about 200 acres of pine contained visible defoliation. Little defoliation is expected in 1968.

Other insects. The pine butterfly, *Neophasia menapia* (Feld. & Feld.), caused light defoliation of ponderosa pine in the Bitterroot National Forest, Mont. Populations are expected to be endemic in 1968. The western pine beetle, *Dendroctonus brevicomis* LeC., continued to fill in the bases of ponderosa pines top-killed by engraver beetles along the Clark Fork drainage. No major increase of this insect is expected. Douglas-fir beetle, *Dendroctonus pseudotsugae* Hopk., populations were endemic in most of the northern Rockies. However, active populations continued in some logging areas. A pitch mass borer, *Vespamima* sp., caused limited group killing of lodgepole and ponderosa pines on the Lolo and Kaniksu National Forests and near St. Ignatius, Mont. Minor infestations were also observed in Glacier National Park.

CENTRAL ROCKY MOUNTAINS [1]

By WILMER F. BAILEY *and* JOHN F. CHANSLER

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Conditions in Brief

The Black Hills beetle remained the most important forest insect in the Central Rocky Mountains during 1967. Infestations were present in ponderosa pine on the San Juan, Roosevelt, and

[1] Includes forested lands in Colorado, Kansas, Nebraska, South Dakota, and Wyoming.

Black Hills National Forests, and on the eastern side of the Big Horn Mountains. Lodgepole pine losses were reported on the Shoshone, Arapaho, and the White River National Forests, and on Cold Springs Mountain in northwestern Colorado. Federal, State, and private land managers used accelerated timber sale programs, including salvage logging, and some chemical application, in an effort to control this insect.

Engelmann spruce beetle is still a threat to thousands of acres of overmature Engelmann spruce stands in Colorado and Wyoming. The only serious infestation was in an old timber sale area on the White River National Forest. Logging debris and scattered blowdown have been the most common causes of small infestations. In timber sale areas this insect is kept under control by logging practices such as trap-tree logging, and the piling and burning of slash and cull material. Air and ground reconnaissance are used to locate and evaluate storm-damaged areas.

An outbreak of pine engraver near Halsey, Nebr., was the first large engraver beetle problem in this Region. A large-scale chemical project in June reduced the epidemic population. However, additional effort may be required to hold the population at acceptable levels.

Acreages of spruce budworm defoliation increased slightly over 1966. Budworm damage was difficult to observe from the air because of new shoot growth after larval feeding. Most sample areas checked on the ground during the egg mass survey showed light to heavy defoliation but no extensive top killing.

Status of Insects

Black Hills beetle, *Dendroctonus ponderosae* Hopk. Scattered small groups of ponderosa pine are still being killed by this insect throughout the Region. On the San Juan National Forest in southwestern Colorado, small groups are widely scattered over several thousand acres. Logging of overmature trees, salvage of insect-infested trees, and chemical control where logging is not feasible continued in an effort to correct the situation.

Along the northern Front Range of Colorado, small infestations still troubled land managers. The largest problem area is on the Redfeather District of the Roosevelt National Forest.

Federal, State, and private land managers in the northern Black Hills continued measures to control the beetle in some localized areas. Elsewhere, efforts were made to keep populations at low levels. Pulpwood cutting and salvage logging have replaced chemical control wherever possible. The largest concentration of tree mortality remained in the Lead-Deadwood, S. Dak., area. Small scattered beetle infestations reappeared in stands treated in 1963 and 1964.

Small outbreaks persisted on the steep eastern slopes of the Big Horn Mountains on Bureau of Land Management and State and private lands. Chemical control or logging was used wherever practical; otherwise, the infestations remained unchecked.

Black Hills beetle activity in lodgepole and limber pine increased in the Region. Tree mortality in these species on State and private and BLM lands in northwestern Colorado was extensive on about 10,000 acres. No control work will be done in this isolated area. A small outbreak in lodgepole pine near Dillon, Colo., is being chemically controlled by State and Federal personnel. Small outbreaks in lodgepole pine on the White River National Forest are being controlled by salvage logging, and by piling and burning. Mortality continued in limber and lodgepole pine on the Lander and Wind River Districts of the Shoshone National Forest.

Engelmann spruce beetle, *Dendroctonus obesus* (Mann.) (*D. engelmanni* Hopk.). Englemann spruce beetle damage was not significant in standing spruce timber. The few beetle infestations in such timber on the Medicine Bow National Forest were effectively controlled by woodpeckers. The beetles were most active in blowdown and sale areas. On the Roosevelt National Forest, all infested blowdown is being salvaged. On the White River National Forest, chemical control of the beetles in slash and cull was necessary because piling and burning would have damaged advanced reproduction. In sale areas of other National Forests, slash disposal and trap-tree logging were keeping the beetles in check.

Spruce budworm, *Choristoneura fumiferana* complex. Infestations total about 100,000 acres.

F–517843

Group-killing of ponderosa pine by the Black Hills beetle. (San Juan National Forest, Colo. 1966.)

The largest area, on the eastern side of the Sangre de Cristo range on the San Isabel National Forest, remains at about 50,000 acres. Heaviest defoliation appeared on Corral Mountain on the San Juan National Forest. Other small infestations are on the Rio Grande, Roosevelt, and Gunnison National Forests. No suppression projects are planned during 1968.

Pine engraver, *Ips pini* (Say). An aggressive infestation was discovered on June 8, 1967, at the Bessey District plantation near Halsey, Nebr., on ponderosa and jack pine weakened during a 10,900-acre fire in 1965. A control project was started on June 18, and within 2 weeks over 50,000 trees were felled and treated with lindane and oil. After the

F—517844

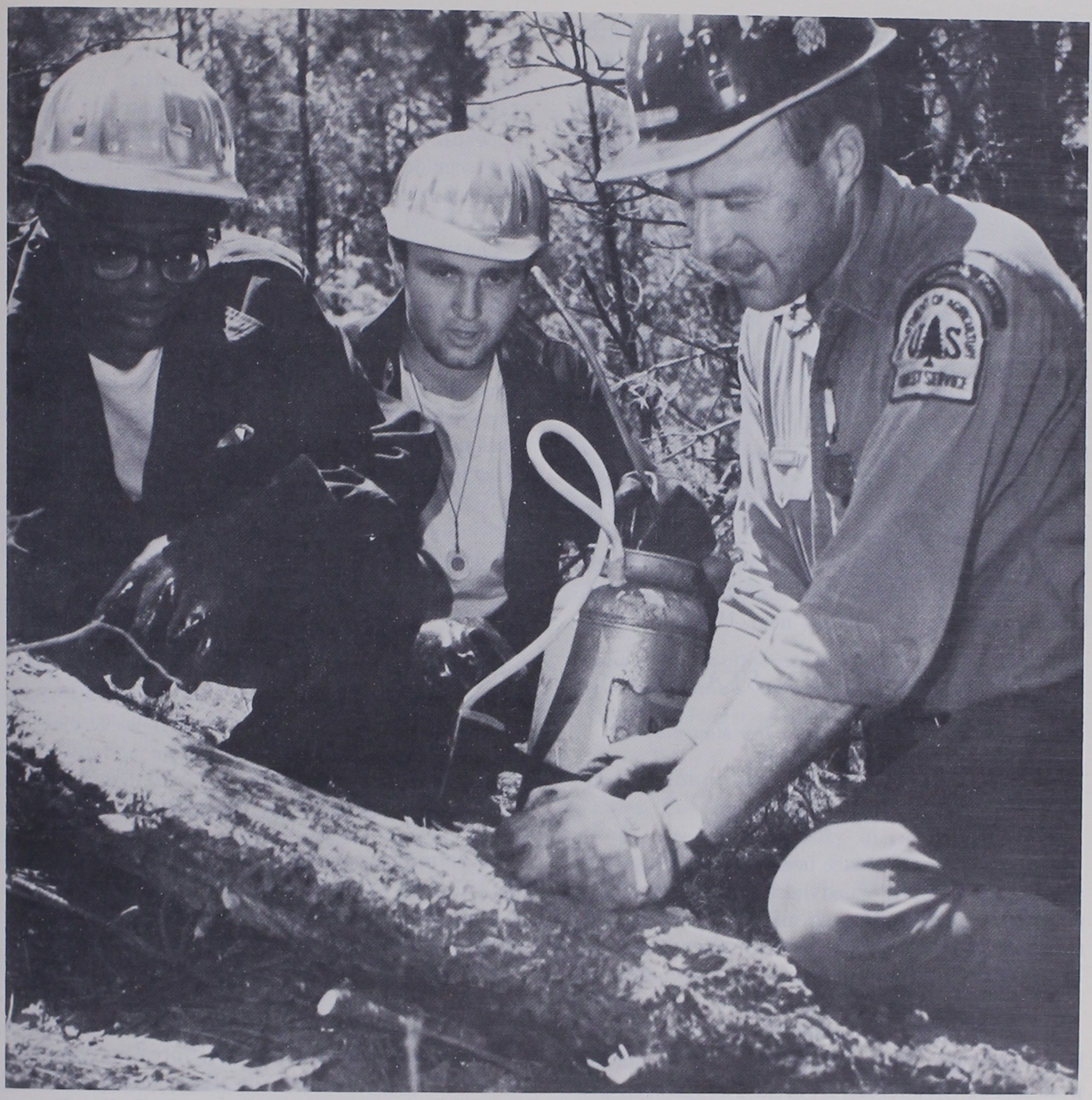
Engelmann spruce timber downed by strong winds in the San Juan National Forest, Colo. Such host material could trigger an epidemic of engelmann spruce beetle.

July beetle flight, another 4,000 trees were treated. Considerable effort may be required to hold the populations to accountable levels.

Increased engraver activity was noted in other parts of the Region. On the San Juan and Grand Mesa-Uncompahgre National Forests, the upper crowns of ponderosa pines have been killed by this insect. West of Saguache, Colo., small groups of young pine in recently logged areas were killed.

Great Basin tent caterpillar, *Malacosoma fragile* (Stretch). Moderate defoliation of aspen was observed in the Chama River drainage on the Rio Grande National Forest. Other forests in Colorado have been comparatively free of this insect for a number of years. No control is planned.

Douglas-fir beetle, *Dendroctonus pseudotsugae* Hopk. Scattered mortality of Douglas-fir was observed. Largest areas of beetle-killed trees are on



F—517846

Job Corpsmen aid Forest Service technician in checking for mortality of pine engraver beetles on fire-weakened ponderosa and jack pine after spraying with insecticide. (Nebraska National Forest near Halsey, Nebr.)

the San Juan and Gunnison National Forests. Control is not planned.

Pandora moth, *Coloradia pandora* Blake. A new outbreak was observed on lodgepole pine near Kauffman Creek, Arapaho National Forest, but the 1965 outbreak in nearby North Battle Creek collapsed. Areas of old infestation on the Routt, Medicine Bow, and Roosevelt National Forests had low populations doing but very little damage. No control is planned.

Tiger moth, *Halisidota ingens* Hy. Edw. Activity of this insect on ponderosa and pinyon pine

was low compared to that of the last 2 years in the Black Forest area northeast of Colorado Springs. Chemical spraying by some property owners has controlled the insect population around their homesites.

Other insects. The roundheaded pine beetle, *Dendroctonus adjunctus* Blandf., and the southwestern pine beetle, *Dendroctonus brevicomis* LeC. (*D. barberi* Hopk.), have been found in association with Black Hills beetle and engraver beetles in overmature ponderosa pine on the San Juan and Grand Mesa-Uncompahgre National Forests. Some aspen stands in the Black Hills of South Dakota were defoliated by a leaf beetle, *Chrysomela* sp. Light defoliation of pondersoa pine by pine budworm, *Choristoneura lambertianae* (Busck), was observed near Pagosa Springs on the San Juan Forest. Larvae, similar to this species, were collected from jack pine on the Bessey District of the Nebraska National Forest. A scarab, *Strigoderma arboricola* Fab., was found in large numbers at the Bessey Nursery near Halsey, Nebr.

SOUTHWESTERN STATES [1]

By D. D. LUCHT, *Division of Timber Management* [2]
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Conditions in Brief

The Engelmann spruce beetle, responding to an ample supply of downed host material which it prefers, increased sharply in 1967, becoming the most active forest insect pest in the Southwest. High populations were found in seven new infestation centers.

A new outbreak of the roundheaded pine beetle killed between 1,000 and 1,200 young ponderosa pine east of Cloudcroft, N. Mex. The Arizona five-spined ips killed about 1,000 pole-size ponderosa pine south of Prescott, Ariz., while the pine engraver continued active at a high level throughout the Southwest. In northern Arizona, mortality from the Douglas-fir beetle continued at a moderate rate in fringe Douglas-fir type.

The Douglas-fir tussock moth was active at four old infestation centers and at two new centers—one at Ruidoso, N. Mex., and another at Weed, N. Mex. In northern Arizona, the 3-year-old white-fir needle miner infestation collapsed. The spruce budworm declined throughout New Mexico. Populations are approaching endemic levels in infested areas.

The southwestern pine tip moth infested 94,000 acres of natural ponderosa pine reproduction and 3,200 acres of plantation seedlings in north central Arizona. Of the total, 16,000 acres sustained severe damage, the remainder only moderate to light damage. About 2,000 acres of the plantation seedlings infested by tip moth are also infested by a sawfly, 200 acres sustaining heavy damage. The alder flea beetle caused moderate to heavy damage to New Mexico alder at Whitewater Canyon Recreation Area near Glenwood, N. Mex.

Cultural control was continued against the Engelmann spruce and the Douglas-fir beetles. Excellent results in maintenance control were obtained by using Thuricide 90 TS against the Nevada buck moth. Chemical control was directed against Arizona five-spined ips in fresh logging slash to prevent further buildup and subsequent attacks on surrounding green trees.

Status of Insects

Engelmann spruce beetle, *Dendroctonus obesus* (Mann.) (*D. engelmanni* Hopk.), populations increased sharply throughout the Southwest. Of seven new infestation centers found, three are in north central New Mexico near Tres Piedras, Espanola, and Pecos; two are on the common boundary of the North Rim of Grand Canyon National Park and the Kaibab National Forest in Arizona; one is at the Arizona Snow Bowl north of Flagstaff; and one is on the Fort Apache Indian Reservation east of Showlow, Ariz.

Larval populations are high at all centers. Logging debris and windthrown trees were responsible for the sharp increase in beetle activity.

The spruce beetle infestation on Mt. Taylor, near Grants, N. Mex., declined this year, but remains a problem. Heavy woodpecker feeding, disposal of infested logging debris, and trapping of beetles in trees poisoned with herbicide, and then felled, contributed to the decline. Three 1965 blowdowns in

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[1] Includes all forested lands in Arizona and New Mexico and National Park Service land in southern Colorado and western Texas.

[2] Seed and cone insect information provided by Dr. H. Grant Kinzer, New Mexico State University, Las Cruces.

mature spruce in the Pecos Wilderness northwest of Las Vegas were too dry to sustain brood development. Unraveling around the edges of these blowdowns is not considered an immediiate threat.

Chemical control is planned only for the infestation at the Arizona Snow Bowl. In the other areas, except in the Pecos Wilderness, salvage logging of windthrown trees and disposal of logging debris are in progress.

Roundheaded pine beetle, *Dendroctonus adjunctus* Blandf. A new outbreak of this beetle killed several groups of young pine containing between 1,000 and 1,200 trees on the Lincoln National Forest east of Cloudcroft, N. Mex. Surveys in mid-November showed about the same number of standing green trees under attack in the immediate vicinity of the previously killed groups. Two previously active infestation centers at Riggs Lake Recreation Area, near Safford, Ariz., and at Ruidoso, N. Mex., remain at low levels.

Southwestern pine tip moth, *Rhyacionia neomexicana* (Dyar), was very active on the Sitgreaves National Forest near Winslow, Ariz. Ground surveys on 100,000 acres showed that 94,000 acres of natural reproduction and 3,200 acres of planted seedlings are infested. The infestation is centered in and around plantations within the Dudley Burn, where 16,000 acres of natural reproduction and planted seedlings showed heavy damage. In the remaining 81,000 infested acres, 63,000 were classed as light and 18,000 as moderate.

A pilot control study, using dimethoate in water applied by helicopter to both natural reproduction and planted seedlings in the heavy infestation area, is planned on 1,200 acres for early 1968.

Douglas-fir tussock moth, *Hemerocampa pseudotsugata* McD. This moth was found in two new areas this year, bringing to six the number of infested areas in Arizona and New Mexico. New outbreaks occurred in southeastern New Mexico—one on ornamental blue spruce, white fir, and Douglas-fir in Ruidoso, and the other on two ornamental white fir trees in the village of Weed. In Santa Fe, where control was used in 1966, only three new egg masses were found. Intensive aerial surveys on the adjacent Santa Fe National Forest failed to reveal any tussock moth damage. In three other old centers, one east of Albuquerque and two near Globe, Ariz., surveys showed static or only slightly increasing populations.

F—518114

Larvae of the southwestern pine tip moth riddle new terminal shoots of ponderosa pine. (Sitgreaves National Forest, Ariz.)

Spruce budworm, *Choristoneura fumiferana* complex. The spruce budworm infestation declined in both area and intensity in the mixed conifer forests of New Mexico. Presently, 300,000 acres are infested. A decrease from 1966 of 140,000 acres occurred on non-Federal lands near Chama and Cimarron, where the infested area dropped from 270,000 to 130,000 acres. On the Carson National Forest east of Taos, the infestation remained static at 80,000 acres. In southern New Mexico, the infestation on the Lincoln National Forest shifted geographically, but remained at 90,000 acres. All populations declined in intensity and are approaching or have reached endemic levels. No control is planned against this pest.

In the Chuska Mountains of the Navajo Indian Reservation in western New Mexico, no defoliation has been observed since the 1963 control project on 100,000 acres of mixed conifer type.

Pine engraver, *Ips pini* (Say). Several infestations of this ips were observed throughout the Southwest. During the early spring, several hundred faded pole-size ponderosa pine were evident

F—518113

Face of an enemy. Exposed Douglas-fir tussock moth pupa on ornametal blue spruce. (Ruidoso, N. Mex.)

in and around Ruidoso, N. Mex. At Point of Pines on the San Carlos Indian Reservation near Globe, Ariz., widespread killing of young pine continued. On the Navajo Indian Reservation north of Window Rock, Ariz., 200 to 300 young ponderosa pine adjacent to logging operations were killed. Examination of slash and cull revealed extremely high populations of the pine engraver. Increased tree mortality is expected in the area as logging continues and the volume of cull, now estimated at 30 to 40 percent of the stumpage volume, accumulates.

Controlled tests, using clear and black polyethylene plastic sheeting to cover infested ponderosa pine slash piles, were carried out in 1967 to determine if solar heat would raise subcortical temperatures to a level lethal to most of the engraver brood produced in the host material. An average of 89 percent mortality was obtained with the clear plastic as compared to 11 percent with the black plastic and 5 percent in uncovered check slash piles.

Arizona five-spined ips, *Ips lecontei* Sw. Tree mortality in pole-size ponderosa pine continued throughout central and north central Arizona. On Pinal Mountain south of Globe, about 3,000 trees were killed; and in the Sierra Ancha Mountains north of Globe, about 5,000. In the Copper Basin area south of Prescott, 1,000 to 1,200 trees were

killed. In this high-use area, infested fresh logging debris was treated with ethylene dibromide in fuel oil to prevent attacks on surrounding green trees.

Douglas-fir beetle, *Dendroctonus pseudotsugae* Hopk. On the Kaibab Plateau of northern Arizona, mortality continued at a moderate rate in fringe Douglas-fir type. Most of the mature trees in the continuous Douglas-fir type have been killed; attacks and resulting mortality are now confined primarily to dwindling numbers of small diameter trees. In the Chuska Mountains of the Navajo Indian Reservation, north of Window Rock, Ariz., about 1,000 trees were killed. Salvage logging operations continued in the area.

White-fir needle miner, *Epinotia meritana* Hein. On the Kaibab Plateau of northern Arizona, the 3-year-old needle miner infestation which started to decline in 1966, collapsed. Defoliation in 1968 is not expected to be above 1 percent. But scenic and recreation values have been seriously impaired by the past 2 years of intensive defoliation. Scattered mortality to white fir is evident in the Saddle Mountain area of the Kaibab National Forest. Deterioration is expected to continue through 1968.

A flannel moth, *Megalopyge* sp. Larvae of this unidentified flannel moth caused moderate defoliation to madrone, oak, and maple in the undeveloped McKittrick Canyon Detached Area of Carlsbad Caverns National Park, N. Mex. (just inside Texas on the State line.) When this area is developed, the larvae of this moth could be a serious nuisance to visitors, as they possess setae which cause a rash when handled.

Alder flea beetle, *Altica ambiens* LeC., caused moderate to heavy damage to New Mexico alder in the Whitewater Canyon Recreation Area near Glenwood, N. Mex. This is the first time this pest has been observed in the area.

A shoot moth, *Dioryctria* sp. (probably *cambiicola* (Dyar) or *baumhoferi* Hein.), was widespread throughout the ponderosa pine type on the western end of the Sitgreaves National Forest south of Winslow, Ariz. Young saplings and overmature yellow pine sustained top kill from the boring and feeding of larvae in the cambium layer. Frequently, the entire sapling was killed. In overmature yellow pine, whole tops were killed, causing deterioration and stagnation in the individual trees. In pole-size ponderosa, larger branches were mined and killed. Flagging of these branches is readily noticeable.

Pine twig beetle, *Pityogenes carinulatus* (LeC.). An epidemic population of this normally secondary twig beetle killed several thousand natural ponderosa pine seedlings on Mt. Taylor near Grants, N. Mex. This epidemic developed in thinning and logging slash put down during the last 2 years. The trend has not been established, but probably will decrease as disturbance to the area decreases.

Fall webworm, *Hyphantria cunea* (Drury), continued to cause moderate damage to native cottonwood and willow at Bandelier National Monument, near Los Alamos, N. Mex. Laboratory tests showed that zectran, pyrethrum, and Thuricide 90 TS are promising materials for webworm control.

A sawfly, *Neodiprion gillettei* (Roh.), was found on 2,000 acres of seedlings on the Sitgreaves National Forest south of Winslow, Ariz. Heavy damage was evident on 200 acres. Feeding alone would probably not be serious, but the seedlings are also sustaining heavy damage by the southwestern pine tip moth.

Seed and cone insects. Seed and cone insects caused proportionately less damage in ponderosa pine and Douglas-fir during 1967 than in the 2 preceding years. Poor cone crops have previously supported high populations on a per-cone basis, but relatively low numbers of total insects. The fair to good 1967 cone crop, therefore, was subjected to low infestation pressures.

In 54 ponderosa pine samples examined, an average of 16.7 percent of the cones were infested with *Laspeyresia* sp., 12.0 percent with *Conophthorus scopulorum* Hopk., 8.1 percent with *Megastigmus albifrons* Wlk., and 6.6 percent with *Dioryctria* sp. In 16 Douglas-fir samples, *Barbara colfoxiana* (Kearf.) (variety unknown), damaged an average of 6.3 percent of the cones. *Dioryctria* sp. and Cecidomyiid larvae were found in 1.3 and 0.6 percent of the Douglas-fir cones, respectively. White fir cones were heavily damaged by *Megastigmus* sp. (23.3 percent) and by *Dioryctria* sp. (50 percent). Cones of Engelmann spruce were heavily attacked by *Laspeyresia* sp., *Barbara* sp., *Dioryctria* sp., and *M. piceae* Roh. These insects were found in 31.4, 11.4, 2.9, and 7 percent of all cones, respectively.

F—518120

***Left*—Adult and pupa of alder flea beetle; *right*—larvae skeletonizing leaf of New Mexico alder.**

Other insects. The fir engraver, *Scolytus ventralis* LeC., remains at very low levels throughout the Southwest. The pale tussock moth, *Halisidota tessellaris* (J. E. Smith), was active at a low level on New Mexico alder at Whitewater Canyon near Glenwood, N. Mex. The Great Basin tent caterpillar, *Malacosoma fragile* (Stretch), remained endemic throughout the Southwest. Extensive mortality by the western balsam bark beetle, *Dryocoetes confusus* Sw., continued in stands of corkbark and alpine fir in New Mexico and northern Arizona. The Nevada buck moth, *Hemileuca nevadensis* Stretch, continued to defoliate native cottonwood at White Sands National Monument near Alamogordo, N. Mex. A tussock moth, *Hemerocampa* sp., remains at low levels on boxelder near Glenwood, N. Mex. The grass plant bug, *Labops hesperius* Uhler, caused increased damage to crested wheatgrass in previously infested areas and spread to new areas in 1967. Life studies of this pest continued on the Santa Fe National Forest near Cuba, N. Mex.

SOUTHERN AND SOUTHEASTERN STATES [1]

By J. C. BELL, L. E. DRAKE, and N. A. OVERGAARD [2]

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Southeastern Area, State and Private Forestry
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Conditions in Brief

Southern pine beetle populations continued epidemic in many areas of Texas, Louisiana, and South Carolina. Increased activity was also reported in the Piedmont Region from Alabama to Virginia. Several large infestations of this beetle exceeding 100 trees each were detected in the mountains of North Carolina, posing a threat in this area for the first time since 1957.

Engraver beetles reached epidemic numbers in localized drought areas of Louisiana, Alabama, Florida, Georgia, North Carolina, and South Carolina.

Seed and cone insect damage continued to concern timberland managers. However, preliminary results from a study of insects affecting longleaf pine seed production indicate most aborted first-year cones are not the result of insect attack.

The balsam woolly aphid continued to kill Fraser fir in North Carolina and Tennessee, although activity was at a lower level than in 1966 due to a wet summer.

The Nantucket pine tip moth remained a serious problem in seed orchards and nurseries in the Southeastern States. Systemic control measures are being studied.

Damage by other defoliating insects continued at approximately the 1966 level.

Status of Insects

Southern pine beetle, *Dendroctonus frontalis* Zimm. Epidemic populations developed over 4.5 million acres of loblolly and shortleaf pine forests in southeastern Texas. The State Forest Service and private owners chemically treated 94,000 beetle-infested trees during 1967. These beetles became very active on the Angelina and Sam Houston National Forests, and infestations spread into southwestern portions of the Sabine National Forest.

A severe outbreak of the southern pine beetle was detected in mid-October over some 338,000 acres in LaSalle, Catahoula, Caldwell, and Grant Parishes in central Louisiana. An aerial survey indicated 74.2 infested trees per 1,000 acres of host type. Epidemics continued near Sulphur in southwestern Louisiana and in East and West Feliciana Parishes in southeastern Louisiana.

In April, the beetles reached a seasonal peak in outbreak areas on the Homochitto National Forest and on private lands in Amite and Wilkinson Counties, Miss., then declined to a relatively low level during the rest of the growing season. Scattered activity was detected on the Natchez Trace Parkway from Washington, Miss., to the southern tip of Hinds County.

A severe outbreak of the southern pine beetle occurred on the Tyger and Enoree Districts of Sumter National Forest in central South Carolina. The estimated level of infestation in September was 132.1 infested trees per 1,000 acres of host type on the Tyger District and 81.6 on the Enoree. Activity also increased in western South Carolina

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[1] Includes forested lands in Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia.

[2] Entomologists at Asheville, N.C.; Macon, Ga.; and Alexandria, La., respectively.

F–518035

Group-killing of southern pines by the southern pine beetle in central Louisiana.

and along the coast. Surveys of a continuing outbreak on the Francis Marion National Forest revealed an average of 17.4 infested trees per 1,000 acres of host type in July and 23.3 in September. Salvage and chemical control operations on both National Forests are helping to reduce losses.

Increased beetle activity was noted throughout the North Carolina Piedmont, with infestations detected in Wayne and Greene Counties for the first time. Control measures were intensified by the State Division of Forestry. Several groups containing more than 100 beetle-infested pines have been discovered in the Nantahala National Forest and adjacent Great Smoky Mountains National Park. This renewed activity in the mountains follows a relatively inactive period between 1959 and 1967.

A southern pine beetle outbreak was detected on the Richmond National Battlefield Park at Richmond, Va. Activity reached a level of 73.4 infested trees per 1,000 acres. Brood densities and ratios of increase indicated the possibility of greater damage.

Beetle activity increased throughout Alabama, with outbreaks on the Bankhead and Talladega National Forests. Chemical control and salvage programs were undertaken.

In Georgia, scattered southern pine beetle infestations continued on the Tallulah and Chattooga Ranger Districts of the Chattahoochee National Forest. The Department of the Interior initiated a chemical control project on 33,000 acres to suppress the beetles on the Piedmont National Wildlife Refuge.

Black turpentine beetle, *Dendroctonus terebrans* (Oliv.). This beetle continued to infest stumps and residual trees in logging areas on the Kisatchie National Forest, La.; the Bienville,

F—518033

The black turpentine beetle infested residual trees following logging operations in many areas of the Gulf South.

De Soto, and Homochitto National Forests in Mississippi; and the National Forests in Texas, but at considerably lower levels than previously. Successful attacks in residual trees were rare and occurred only in mechanically injured trees located on low, wet sites.

Infestations in naval stores production areas of Georgia and Florida increased considerably during 1967. The Georgia Forestry Commission reported the highest level of activity in recent years. An August survey for bark beetles revealed the black turpentine beetle as the primary insect pest in several locations on the Uwharrie District of the Uwharrie National Forest in North Carolina, where the infestation level remained the same as in 1966. Other infestations found throughout the State were associated with engraver beetles and southern pine beetle.

Southwestern pine beetle, *Dendroctonus brevicomis* LeC. (*D. barberi* Hopk.). A localized infestation was discovered in ponderosa pine near the summit of Black Mountain in the Davis Mountains of western Texas.

Engraver beetles, *Ips* spp. Extensive infestations of the engraver beetle, *Ips avulsus* (Eichh.), occurred over portions of central Louisiana during October, apparently the result of a prolonged drought in late summer. *I. avulsus* was closely associated with the southern pine beetle, frequently as the primary invader in the thin-barked portions of the upper crown, with the southern pine beetle a secondary pest.

Engraver beetle infestations also increased seasonally in local areas of Georgia, Florida, and Alabama where rainfall was deficient, and where southern pine beetle infestations were present.

Several group kills resulting from infestation by *I. avulsus* and *Ips grandicollis* (Eichh.) were detected on the Stearns and Williamsburg Districts of the Daniel Boone National Forest in Kentucky in areas severely storm-damaged. The relatively low level of engraver beetle infestation in residual trees was probably the result of an intensive salvage program initiated by Forest personnel.

A considerable late-summer increase in engraver beetle activity was noted in the North Carolina Piedmont. Epidemic populations of *I. avulsus* and *Ips calligraphus* Germ. were detected on the Uwharrie National Forest, a contributing factor being the 10-inch rainfall deficit during the summer.

Seed and cone insects. Two shortleaf pine seed production areas in the Ozark-St. Francis National Forest in Arkansas were sprayed by helicopter to suppress seed and cone insect infestations. This was the third consecutive year that these areas were treated. Preliminary results indicate a lower incidence of insect infestations in cones from sprayed trees than from unsprayed trees. Most insect-caused damage was attributed to several species of coneworms, *Dioryctria* spp., and seed moths, *Laspeyresia* spp.

Preliminary data from studies in several longleaf pine seed production areas in Florida and South Carolina indicated that insect attack was not the primary cause of first-year cone abortion.

Dioryctria spp., coneworm damage continued at a moderate level in a shortleaf seed production area on the Nantahala National Forest in North

F—518029

Adult coneworm, *Dioryctria amatella*. This insect causes significant cone losses in the Southeast.

Carolina and in two lobolly seed production areas on the Sumter National Forest in South Carolina.

An unchecked epidemic of the white-pine cone beetle, *Conophthorus coniperda* (Sz.), in the Ellicott Rock Seed Production Area on the Highland District of the Nantahala Forest resulted in an almost complete loss of the 1967 cone crop. No practical control method has been developed.

The impact of insect damage on scion stock from superior trees in eastern Texas and Louisiana was evaluated during the spring of 1967. Several insects were found damaging, but their overall impact was relatively low. The most common pests were coneworms, *Dioryctria* spp., and gall weevils, *Podapion* spp. Other insects found damaging scion material included midges, thrips, and a scolytid, *Pityophthorus pulicarius* (Zimm.).

Balsam woolly aphid, *Chermes piceae* Ratz., continued to ravage Fraser fir stands in North Carolina, but at a lower level than in 1966. Extremely wet summer conditions contributed to the reduced activity. A single new infestation area was detected on Grandfather Mountain. The spruce-fir forests on the Balsam Mountains, N.C., and Mount Rogers National Recreation Area, Va., are still apparently free from aphid infestations.

Pine sawflies, *Neodiprion* spp. Populations of the loblolly-pine sawfly, *Neodiprion taedae linearis* Ross, in southern Arkansas were lower in 1967 than in previous years. Some increased activity was

F—518034

This coneworm, Dioryctria clarieralis, damaged scion material from superior trees in Texas and Louisiana.

reported from northern Ashley County, however. A localized infestation was again detected on private land near Georgetown, La., but populations appeared lower than in 1966.

Localized outbreaks of the red-headed pine sawfly, *Neodiprion lecontei* (Fitch) were reported throughout Alabama and Georgia. This sawfly also caused limited defoliation on longleaf and slash pines on the Kisatchie National Forest and on private lands in Vernon Parish, La.

Infestations by the Virginia pine sawfly, *Neodiprion pratti pratti* (Dyar) continued to occur on scattered pines and in pine plantations on the Morehead District of the Daniel Boone National Forest in Kentucky. Some mortality of overmature pine is noted.

Nantucket pine tip moth, *Rhyacionia frustrana* (Comst.), continued to be a serious problem in seed orchards, nurseries, and pine plantations throughout the Southern and Southeastern States. Damage was especially heavy at the F. H. Claridge State Orchard in North Carolina. A cooperative pilot project using systemic insecticides to control the tip moth at several State and Federal orchards is being considered.

Tent caterpillars, *Malacosoma* spp. Epidemic populations of the forest tent caterpillar, *M. disstria* Hbn., occurred over some 174,000 acres in the Atchafalaya River Basin in southern Louisiana. Approximately 86,000 acres were heavily defoliated. Sweetgum, black willow, water oak, and willow oak were most severely damaged. Biological evaluations by U.S. Forest Service entomologists revealed the presence of a polyhedral virus causing mortality of the tent caterpillar larvae, and disclosed considerable parasitism by a Sarcophagid fly.

Moderate and heavy defoliation of tupelo, sweetgum, and oak by the forest tent caterpillar in the Mobile River Basin in Baldwin County, Ala., decreased from 20,800 acres in 1966 to 13,000 acres in 1967. However, light defoliation was more widespread.

A statewide survey of defoliation by the eastern tent caterpillar, *M. americanum* (F.), revealed moderate to heavy defoliation in the north central and northeastern portions of Kentucky. Defoliation was light over the rest of the State.

Other defoliators. Infestations of the fall webworm, *Hyphantria cunea* (Drury), were common throughout central Louisiana and Mississippi, particularly on bitter pecan. Heavy infestations occurred along the northern portions of the Natchez Trace Parkway in Mississippi near Tupelo. Light-to-moderate infestations occurred on the Platt National Park and the Arbuckle Recreation Area near Sulphur, Okla. Infestations were also apparent throughout much of Alabama, Georgia, and South Carolina. The oak leaf tier, *Croesia albicomana* (Clem.), was epidemic for the third consecutive year over portions of the James River District of the George Washington National Forest in Virginia. Severe damage by the locust leaf miner, *Xenochalepus dorsalis* (Thunb.), was noted in Virginia, Alabama, and Tennessee. Infestations of the mimosa webworm, *Homadaula albizziae* Clarke, were reported throughout Alabama. Light infestations of the elm leaf beetle, *Pyrrhalta luteola* (Müller), and the larger elm leaf beetle, *Monocesta coryli* (Say), caused light damage to elm trees in Alabama and Georgia. Localized areas of hardwood defoliation by the walkingstick, *Diapheromera femorata* (Say), were reported from Dutch Mountain, near Danville, Ark. A

young plantation of eastern cottonwood in Rapides Parish, La., was heavily damaged by the cottonwood leaf beetle, *Chrysomela scripta* F.

NORTHEASTERN STATES [1]

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Conditions in Brief

Defoliators remained the most troublesome insect pests in the Northeastern States.

The spruce budworm increased in northern Minnesota and also in northern Maine, where another suppression project may be necessary.

In Michigan, Minnesota, and Wisconsin, the jack-pine budworm heavily defoliated jack pine on thousands of acres and may require suppression in 1968 to prevent substantial tree mortality.

The fall cankerworm and oak leaf tier complex continued to defoliate oaks in New Jersey, New York, Pennsylvania, and West Virginia. Supression is planned by New Jersey on 40,000 acres in 1968.

The saddled prominent became quite active again, defoliating thousands of acres of northern hardwoods in the Northeastern States.

Defoliation by the forest tent caterpillar increased throughout the 20-State area.

Damage to red pine plantations by the Saratoga spittlebug in the Lake States continued, and suppression was needed on 1,000 acres.

The balsam woolly aphid decimated stands of balsam fir in Maine, New Hampshire, and Vermont.

Beech has been killed throughout New England and eastern New York by the beech scale-nectria complex.

Birches throughout New England were heavily defoliated by the feeding of the birch leaf miner and the birch leaf skeletonizer.

Other important insects in the Northeastern Area were the white-pine weevil, maple scale, red pine scale, gypsy moth, brown-tail moth, leaf mining weevil of yellow-poplar, red-headed pine sawfly, pine tussock moth, and the pine tortoise scale.

Status of Insects

Spruce budworm, *Choristoneura fumiferana* (Clem.). Severe defoliation occurred on 200,000 acres in the Superior National Forest, Minn. Balsam-fir type makes up 25 percent of the area; the fir was nearly stripped of its current foliage. Suppression is not planned for timber protection, but some localized spraying may be done on recreation areas and campgrounds.

In northern Aroostook County, Me., 100,000 acres of spruce-fir type were sprayed with DDT by the Maine Forest Service in June 1967. Another 80,000 acres with budworm infestation may require chemical control in 1968, but a less persistent and less ecologically hazardous pesticide probably will be used. A pilot test of a carbamate insecticide, Zectran, was made by the U.S. Forest Service within the Aroostook County infestation; results of the test indicated that Zectran was not yet ready for operational use.

Jack-pine budworm, *Choristoneura pinus* Free. Moderate to severe defoliation occurred throughout the Lake States. On the Chippewa National Forest, jack-pine areas defoliated in 1966 were sampled and the loss of commercial volume estimated at 25 percent. Egg mass samples indicate high budworm populations in northern Michigan and Wisconsin in 1968. Suppression projects are contemplated for the Upper Michigan and northern Wisconsin outbreaks. In 1967, Wisconsin carried out limited tests of Zectran, Matacil, and trichlorfon; Zectran achieved a 91-percent reduction of the budworm population.

Pine tussock moth, *Dasychira plagiata* (Wlk.). Egg counts made by the Wisconsin Conservation Department indicated increasing populations of the insect in the northwestern part of the State. Light to moderate defoliation is expected on 20,000 acres of jack pine in Douglas County. A combination of the tussock moth and the jack-pine bud-

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[1] Includes forested lands in Connecticut, Delaware, Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia, and Wisconsin.

[2] Report compiled from information submitted by the field representatives at Amherst, Mass.; Delaware, Ohio; St. Paul, Minn.; and State pest control personnel.

worm in moderate numbers can be destructive, but no control is anticipated for 1968.

Saddled prominent, *Heterocampa guttivitta* (Wlk.), defoliated several thousand acres of northern hardwoods in Michigan, Wisconsin, Maine, Massachusetts, New York, and Vermont. In Pennsylvania, 30,000 acres of northern hardwoods have been completely defoliated and another 50,000 acres moderately defoliated. Populations are expected to remain static, and no suppression is planned.

Fall cankerworm, *Alsophila pometaria* (Harris), and **oak leaf tier,** *Croesia albicomana* (Clem.). This insect complex defoliated more than half a million acres of oak type in New Jersey. New Jersey is proposing a suppression project of 40,000 acres using carbaryl. In Pennsylvania and West Virginia, this insect complex has moderately defoliated 590,000 acres of oak type and heavily defoliated 540,000 additional acres. However, no suppression is planned in either State for 1968.

Forest tent caterpillar, *Malacosoma disstria* Hbn. Moderate to severe defoliation of aspen occurred in northern Minnesota along the Canadian border. An aerial survey indicated a 20-mile-wide belt of defoliation from International Falls to the Cook County line. This is a southeasterly extension of the 1966 infestation. A small outbreak was also reported near Charlevoix, Mich. In New England, larvae were much more prevalent than last year, and a population increase is expected. Scattered heavy defoliation of oak occurred in southwestern Illinois, and light defoliation occurred in northern Pennsylvania. No suppression is planned for this insect in any locality.

Larch sawfly, *Pristophora erichsonii* (Htg.). Larch was defoliated throughout the 20-State area, with tree mortality occurring in New England and the Lake States. The population trend appears to be downward everywhere but in the Lake States, where it is upward. No suppression is planned anywhere for 1968.

Balsam woolly aphid, *Chermes piceae* Ratz., continues to decimate stands of balsam fir. In Vermont some 5,400 acres were infested, while in New Hampshire tree mortality spread over a 3,000-acre area. Maine had large areas infested particularly along the coast. Continued efforts are being made to salvage infested trees.

Saratoga spittlebug, *Aphrophora saratogensis* (Fitch). Pest control personnel made damage appraisal surveys on 7,000 acres of National Forest land in the Lake States. The Wisconsin Conservation Department surveyed 2,000 acres of State land. Spittlebug populations increased in Minnesota and Wisconsin, but were static in Michigan. Suppression was carried out by helicopter and backpack mist blower on about 1,000 acres, using malathion at a rate of 0.5 pounds per acre.

Red-headed pine sawfly, *Neodiprion lecontei* (Fitch). Scattered infestations continued in Michigan, New Hampshire, Vermont, and Wisconsin. Heavy damage to plantations in New York and Vermont made chemical control necessary in some areas; carbaryl and malathion were used in these cases. Populations are increasing in the Lake States but remain static throughout the Northeast.

White-pine weevil, *Pissodes strobi* (Peck). Moderate to severe damage continued in plantations of white, red, and jack pine, and on white spruce, in the Lake States. In New England, damage was severe on white pine and Norway spruce; essentially the same conditions existed in Pennsylvania and New York. About 1,000 acres of white pine plantations were treated chemically during 1967. Populations generally are declining throughout the 20-State area.

Pine tortoise scale, *Toumeyella numismaticum* (P. & M.). Heavy infestations were common in natural stands of jack pine in Marinette and Florence Counties, Wis.; populations were low in northwestern counties. The insect continued to be a problem in Christmas tree plantings. Generally, populations are declining.

Red-pine scale, *Matsucoccus resinosae* B. & G. Surveys completed in March 1967 indicated a slow westerly spread of this insect.

Birch leaf miner, *Fenusa pusilla* (Lep.), and **birch skeletonizer,** *Bucculatrix canadensisella* (Chamb.), were responsible for the defoliation of white, yellow, and gray birch on thousands of acres throughout New England and New York. Population trends will be upward in 1968, but no suppression is planned.

Beech scale, *Cryptococcus fagi* (Baer.), and its fungus associate, *Nectria coccinea* var. *faginata* Lohman, Wats. & Ayers, have been responsible

for the death of thousands of commercial size beech trees in Maine, Massachusetts, New Hampshire, New York, and Vermont. The insect-fungus complex continued to spread with no apparent halt in its westerly progress. Suppression has been limited to recreation areas and ornamental trees. Salvage cuttings were carried out on the White Mountain and Green Mountain National Forests.

Pine leaf chermid, *Pineus pinifoliae* (Fitch). Population trends are upward in New Hampshire, Vermont, and West Virginia, but static in Maine and New York.

Maple scale, *Cryptococcus* sp. The taxonomic status of this insect is still not firm, but it should be established in 1968. Surveys conducted in 1967 indicated that the insect occurs at least in Maine, Massachusetts, and Vermont, wherever sugar maple is found. Because the insect is a recent discovery, its destructive capability is unknown.

Gypsy moth, *Porthetria dispar* (L.). Following a year of relative scarcity, the population trend of this insect appears to be upward. Suppression is tentatively planned for infestations in New Jersey.

Brown-tail moth, *Nygmia phaeorrhoea* (Don.). Infestations persisted in the vicinity of Cape Cod, Mass., and the trend is expected to continue upward. Suppression was attempted using carbaryl, but no control was achieved.

A leaf-mining weevil, *Odontopus calceatus* (Say). This insect has been responsible for heavy defoliation of yellow-poplar in Connecticut, New Jersey, Pennsylvania, Ohio, and West Virginia. Populations are expected to remain static in 1968; no suppression is planned.

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